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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIV. Part 1. 10th January, 1916.

ARTIFICIAL FERTILIZERS ACT.

Unit Values for 1916.

By P. Rankin Scott, Chemist for Agriculture.

The term fertilizer under this Act means any substance containing nitrogen, phosphoric acid, or potash, manufactured, produced, or prepared in any manner for the purpose of fertilizing the soil or supplying nutriment to plants, but does not include farmyard or stable manure, or any crude night-soil, crude offal, or other unmanufactured refuse.

The Act requires every manufacturer and importer of manures, who desires to have a brand registered in respect of any manure, to make application to the Secretary for Agriculture for the registration of such brand on or before the 1st day of November in each year.

Every such application shall set forth the full name and place of business of the applicant, the name, figure, trade mark, or sign to be attached or associated with the manure to identify it, the raw materials from which the fertilizer is manufactured, and a statement of analysis showing the composition of the manure in respect to the ingredients nitrogen, phosphoric acid, and potash, and the respective forms in which they occur, and the retail price of the manure. This list shall be published in the *Government Gazette*. No fertilizer shall be sold except in parcels. Every such parcel and every invoice certificate and label used in connexion with such fertilizer shall be marked with a registered brand in such manner as is prescribed.

First, upon the sale of any fertilizer, the vendor shall at the time of sale or before delivery of the same, give to the purchaser an invoice

certificate, signed by the vendor or his agent, stating the name and place of business of the vendor, the figure, trade mark, or other sign attached to or associated with the fertilizer and intended for identifying it.

The quantity of fertilizer comprised in the sale, the proportion per centum in which such fertilizer contains the following ingredients—Nitrogen, phosphoric acid, and potash, and the forms in which they respectively occur must be stated as provided in Second Schedule.

Secondly, every person who sells or offers or exposes for sale any fertilizer, and every dealer in fertilizers who has in his possession any fertilizer, shall securely and conspicuously affix to each parcel thereof a plainly printed label of linen or other suitable material, clearly and truly certifying:—

The number of net pounds of fertilizer in the parcel, the figure, trade mark, or other sign under which the fertilizer is sold, the name and address of the manufacturer or importer, the place of manufacture, and giving a chemical analysis stating the proportion per centum in which the fertilizer contains the three ingredients—nitrogen, phosphoric acid, and potash, and the respective forms in which they respectively occur, as required to be stated in the invoice certificate.

Percentage of deficiency allowed in regard to ingredients of fertilizing value:—

—	Nitrogen.	Potash readily soluble.	Phosphoric Acid.		
			Water soluble.	Citrate soluble.	Citrate insoluble.
Fertilizers containing Nitrogen ..	0·50				
Fertilizers containing Potash ..	..	1·00			
*Fertilizers containing Phosphoric Acid	..	..	1.00	1·00	1·00

* Provided that the total phosphoric acid deficiency shall not exceed 1·50 per cent.

The Valuation of Manures from Analysis.

The commercial value of a manure can be found by multiplying the percentage of the nitrogen, phosphoric acid, or potash content of the manure as stated on the label or invoice certificate by the unit value fixed for the ingredient, in the form in which it is guaranteed to be present in the manure. As, for example, in the case of superphosphate:—

			s. d.		Value per ton.
Water soluble phosphoric acid	17·0	×	4 10	=	£4 2 2
Citrate soluble phosphoric acid	0·5	×	4 7	=	0 2 4
Citrate insoluble phosphoric acid	0·5	×	2 0	=	0 1 0
Total					£4 5 6

Fertilizers Act 1915.

UNIT VALUES FOR THE YEAR 1916 AS CALCULATED FROM THE DECLARED PRICES OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE.

	s.	d.
1 per cent. Nitrogen as Nitrate	18	9
1 per cent. Nitrogen as Ammonia	17	6
1 per cent. Nitrogen as Blood	16	9
1 per cent. Nitrogen as *Fine Bone*	15	6
1 per cent. Nitrogen as Coarse Bone and Flesh	14	6
1 per cent. Phosphoric Acid as Water Soluble	4	10
1 per cent. Phosphoric Acid as Citrate Insoluble	4	7
1 per cent. Phosphoric Acid as Fine Bone	4	7
1 per cent. Phosphoric Acid as Coarse Bone	3	0
1 per cent. Phosphoric Acid as Citrate Insoluble in High-grade Bone Fertilizer and Super., Bone Fertilizer, and Dried Blood	3	0
1 per cent. Phosphoric Acid as Citrate Insoluble *in all other Manures*	2	0
1 per cent. Potash as Sulphate	9	7

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652).

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.	Potash.	Price asked for the Manure per ton.	Where Obtainable.
		%	%	%	£ s. d.	
Mainly Nitrogenous.						
Nitrate of Soda	Wischer and Co. ..	15·50	..	..	14 10 0	Wischer and Co. Prop. Ltd., William-street, Melbourne
"	Sickle	15·50	..	..	14 10 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
"	M.L.	15·50	..	..	14 10 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
"	Federal S.N. ..	15·50	..	..	14 10 0	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
Sulphate of Ammonia	Wischer and Co. ..	20·00	..	..	18 0 0	Wischer and Co. Prop. Ltd., William-street, Melbourne
" "	M.G. Co.	20·59	..	..	16 0 0	The Metropolitan Gas Co., Flinders-street, Melbourne
" " ..	Sickle	20·00	..	..	18 0 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
" "	M.L.	20·00	..	..	18 0 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
"	Federal A.S. ..	20·00	..	..	18 0 0	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
Blood Manure	Federal	7·50	1·00	..	6 15 0	" " "
"	M.L.	11·00	..	..	10 0 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
"	M.C.C.	7·50	1·00	0·41	5 5 0	The Melbourne City Council, Town Hall, Melbourne
Dried Blood	*Imperial*	11·00	.	..	9 0 0	W. Angliss and Co. Prop. Ltd., Bourke-street, Melbourne
Blood Manure	Wischer and Co. ..	7·50	1·00	..	6 15 0	Wischer and Co. Prop. Ltd., William-street, Melbourne
"	Sickle	7·50	1·00	..	6 15 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
"	M.L.	7·50	1·00	..	6 15 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
"	Hasell's	10·25	..	..	8 10 0	Arthur H. Hasell, *Queen-street*, Melbourne
Mainly Potassic.						
Sulphate of Potash	Hasell's	..	..	52·00	25 0 0	Arthur H. Hasell, Queen-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Citrate In-soluble.	Phosphoric Acid. Total.	Potash.	Price asked for the Manure per ton.	Where Obtainable.
Phosphate readily Soluble.		%	%	%	%	%	%	£ s. d.	
Superphosphate ..	Federal O.S. ..	..	17·00	1·50	0·50	18·00	..	4 7 6	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
"	*M.L. No. 1* ..	..	17·00	0·50	0·50	18·00	..	4 7 6	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
"	Cockbill's ..	..	17·00	1·00	2·00	20·00	..	4 10 0	J. Cockbill, Post Office-place, Melbourne
"	Rohs	..	16·85	1·70	0·45	19·00	..	4 10 0	P. Rohs Prop. Ltd., Bendigo
"	Hasell's	..	17·50	0·50	2·00	20·00	..	4 7 6	Arthur R. Hasell, Queen-street, Melbourne
"	Sickle	..	17·00	0·50	0·50	18·00	..	4 7 6	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
"	Wischer and Co. No. 1	..	17·00	0·50	0·50	18·00	.	4 7 6	Wischer and Co. Prop. Ltd., William-street, Melbourne
Concentrated Superphosphate	*Wischer and Co.* ..	..	40·00	4·00	..	44·00	..	12 10 0	" " " "
" " "	Sickle	..	40·00	4·00	..	44·00	..	12 10 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
" " "	M.L.	..	40·00	4·00	..	44·00	..	12 10 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
" " "	Federal Conc. S. ..	..	40·00	4·00	..	44·00	..	12 10 0	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
Phosphatic, moderately Soluble.									
Basic Phosphate ..	Wischer and Co. ..	..	..	14·00	3·00	17·00	..	4 5 0	Wischer and Co. Prop. Ltd., William-street, Melbourne
" " ..	Sickle	..	..	14·00	3·00	17·00	..	4 5 0	*Cuming, Smith,* and Co. Prop. Ltd., William-street, Melbourne
" " ..	M.L.	..	..	14·00	3·00	17·00	..	4 5 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
" " ..	Federal B.P. ..	..	..	14·00	3·00	17·00	..	4 5 0	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne

List of Fertilizers Registered at the Office of the Director of Agriculture under the Fertilizers Act 1915—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Citrate In-soluble.	Phosphoric Acid. Total	Potash.	Price asked for the Manure per ton.	Where Obtainable.
Phosphatic, difficultly Soluble.		%	%	%	%	%	%	£ s. d.	
Ground Phosphate ..	Wischer and Co., 50%	..	..	..	23·00	23·00	..	3 10 0	Wischer and Co. Prop. Ltd., William street, Melbourne
,, ,, ..	Wischer and Co., 80%	..	..	..	36·65	36·65	..	5 0 0	,, ,, ,, ,,
,, ,, ..	Sickle, 50% ..	..	..	..	23·00	23·00	..	3 10 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
,, ,, ..	Sickle, 80% ..	..	..	..	36·65	36·65	..	5 0 0	,, ,, ,, ,,
,, ,, ..	M.L., 50% ..	..	..	..	23·00	23·00	..	3 10 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
,, ,, ..	M.L., 80% ..	..	..	..	36·65	36·65	..	5 0 0	,, ,, ,, ,,
,, ,, ..	Federal G.P., 80% ..	..	..	..	36·65	36·65	..	5 0 0	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
Containing Phosphoric Acid and Nitrogen moderately Soluble.									
Nitro Superphosphate ..	Federal N.S. ..	1·50	12·00	1·25	3·95	17·20	..	5 10 0	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
,, ,, ..	Wischer and Co. ..	*2·00	12·96	0·38	1·53	14·87	..	5 10 0	Wischer and Co. Prop. Ltd., William-street, Melbourne
,, ,, ..	Sickle	*2·00	13·00	0·39	1·61	15·00	..	5 10 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
,, ,, ..	M.L.	*2·00	13·00	0·38	1·37	14·75	..	5 10 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
Dissolved Bones and Superphosphate	Wischer and Co. ..	1·00	10·00	3·63	4·73	18·36	..	5 10 0	Wischer and Co. Prop. Ltd., William-street, Melbourne
,, ,, ..	Sickle	1·00	10·00	3·63	4·73	18·36	..	5 10 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
,, ,, ..	M.L.	1·00	10·00	3·45	4·37	17·82	..	5 10 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
High Grade.									
Bone Manure and Superphosphate	Cockbill's No. 1 ..	1·75	12·00	2·00	4·50	18·50	..	5 10 0	J. Cockbill, Post Office-place, Melbourne
Blood and Bone Fertilizer and Superphosphate	*Federal B.B.S.* ..	2·50	8·50	1·75	6·25	16·50	..	6 5 0	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
,, ,, ,,	M.L.	2·50	8·50	1·75	6·25	16·50	..	6 5 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
,, ,, ,,	Sickle (B) ..	2·50	8·50	1·75	6·25	16·50	..	6 5 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
,, ,, ,,	Wischer and Co. ..	2·50	8·50	1·75	6·25	16·50	..	6 5 0	Wischer and Co. Prop. Ltd., William-street, Melbourne

List of Fertilizers Registered at the Office of the Director of Agriculture under the Fertilizers Act 1915—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Citrate Insoluble.	Phosphoric Acid. Total.	Potash.	Price asked for the Manure per ton.	Where Obtainable.
Low Grade.		%	%	%	%	%	%	£ s. d.	
Bone Manure *and* Superphosphate	Cockbill's No. 2 ..	0·90	14·45	1·60	3·20	19·25	..	5 5 0	J. Cockbill, Post Office-place, Melbourne
Bone and Superphosphate	Hasell's B. ..	0·80	12·75	1·75	4·75	19·25	..	5 4 0	Arthur H. Hasell, Queen-street, Melb.
Bone Fertilizer and Superphosphate (143)	Federal B.S. No. 3	0·75	12·75	1·13	3·62	17·50	..	5 5 0	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
Bone Fertilizer and Superphosphate	M.L. No. 1 ..	1·50	8·50	3·25	5·25	17·00	..	5 12 6	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
Bone and Superphosphate	Hasell's A. ..	1·50	8·50	3·00	7·00	18·50	..	5 11 0	Arthur H. Hasell, Queen-street, Melb.
Bone Fertilizer and Superphosphate	Federal B.S. No. 1	1·50	8·50	1·75	6·75	17·00	..	5 12 6	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
" " "	M.L. No. 2 ..	0·75	12·75	1·38	3·37	17·50	..	5 5 0	Mt. Lyell M. and R. Co. Ltd., Collins-street, Melbourne
Bone and Superphosphate	Gardiner's ..	1·25	8·00	3·20	5·80	17·00	..	5 5 0	Geo. Gardiner and Co. Prop. Ltd., Marshalltown
Bone Fertilizer and Superphosphate	Sickle (C.) ..	0·75	12·75	1·37	3·38	17·50	..	5 5 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
" " "	Sickle (A.) ..	1·50	8·50	3·25	5·25	17·00	..	5 12 6	" " " "
A.N.A. " Surprise " Animal Fertilizer and Superphosphate	A.N.A. Surprise ..	1·50	7·59	2·00	7·00	16·59	..	5 15 0	G. W. Pennell, Braybrook
Bone Dust and Superphosphate	Rohs	1·50	9·00	2·25	5·75	17·00	..	5 12 6	P. Rohs Prop. Ltd., Bendigo
Bone Fertilizer and Superphosphate	Wischer and Co. No. 2	0·75	12·75	1·37	3·38	17·50	..	5 5 0	Wischer and Co. Prop. Ltd., William-street, Melbourne
" " "	Wischer and Co. No. 1	1·50	8·50	3·25	5·25	17·00	..	5 12 6	" " " "
Containing Nitrogen and Phosphoric Acid; Nitrogen moderately Soluble, Phosphoric Acid difficulty Soluble.									
Blood and Bone Fertilizer	Federal B. and B.F.	5·00	..	3·00	12·00	15·00	..	7 0 0	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
" " "	Wischer and Co. ..	5·00	..	3·00	12·00	15·00	..	7 0 0	Wischer and Co. Prop. Ltd., William-street, Melbourne
" " "	Sickle	5·00	..	3·00	12·00	15·00	..	7 0 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
Bone and Blood ..	Hasell's No. 1 ..	6·75	..	5·55	4·00	9·55	..	7 2 6	Arthur H. Hasell, Queen-street, Melb.
Blood and Bone Fertilizer	M.L. (A.) ..	5·00	..	3·00	12·00	15·00	..	7 0 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915—*continued.*

Description of Manure.	Brand.	Nitrogen	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Citrate In-soluble.	Phosphoric Acid. Total.	Potash.	Price asked for the Manure per ton.	Where Obtainable.
		%	%	%	%	%	%	£ s. d.	
Containing Nitrogen and Phosphoric Acid moderately Soluble.									
HIGH GRADE.									
Bone Fertilizer	Ark	4·06	..	5·69	11·16	16·85	..	6 0 0	Arthur Murphy, Ararat
Bone Manure	Cockbill's ..	6·00	..	5·00	10·00	15·00	..	7 0 0	J. Cockbill, Post Office-place, Melbourne
Fertilizer	Special Magic ..	5·00	..	3·00	10·00	13·00	..	6 10 0	Geo. Gardiner and Co. Prop. Ltd., Marshalltown
Containing Nitrogen and Phosphoric Acid difficulty Soluble.									
LOW GRADE.									
Bone Fertilizer	Cockbill's ..	3·50	..	3·50	14·75	18·25	..	5 10 0	J. Cockbill, Post Office-place, Melbourne
" "	Federal B.F. ..	3·00	..	3·00	13·00	16·00	..	6 2 6	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
" "	M.L. (B.) ..	3·00	..	3·00	13·00	16·00	..	6 2 6	*Mt. Lyell M. and R. Co. Ltd.*, Little Collins-street, Melbourne
Fertilizer	Magic No. 2 ..	1·50	..	3·00	13·00	16·00	..	5 0 0	George Gardiner and Co. Prop. Ltd., Marshalltown
"	Magic No. 1 ..	2·00	..	3·00	14·00	17·00	..	5 5 0	" " "
Bone Fertilizer	Sickle	3·00	..	3·00	13·00	16·00	..	6 2 6	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
Animal Fertilizer ..	A.N.A. *Surprise* ..	3·00	..	4·00	12·00	16·00	..	6 5 0	G. W. Pennell, Braybrook
Bone Fertilizer ..	Wischer and Co. ..	3·00	..	3·00	13·00	16·00	..	6 2 6	*Wischer and Co. Prop. Ltd.*, William-street, Melbourne

* Containing 1·50 % Nitrogen as Ammonium Sulphate

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked for the *Manure* per ton.	Where Obtainable.
				Fine.	Coarse.		
Containing Nitrogen and Phosphoric Acid moderately Soluble. *HIGH GRADE.*		%	%	%	%	£ s. d.	
Bonemeal	Wischer and Co. ..	3·00	19·00	30·00	70·00	7 5 0	Wischer and Co. Prop. Ltd., William-street, Melbourne
Bonedust	Ox	3·15	22·00	33·00	67·00	6 0 0	Executors of Thos. Brown, Hamilton
„	Rohs	4·00	18·00	55·00	45·00	6 2 6	P. Rohs Prop. Ltd., Bendigo
Bonemeal	Sickle	3·00	19·00	30·00	70·00	7 0 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
„	M.L.	3·00	19·00	30·00	70·00	7 0 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
Bonedust	Brown Hill ..	2·50	18·00	30·00	70·00	6 0 0	Alfred A. Turner, Ballarat East
„	Marvell	3·74	23·62	36·00	64·00	6 10 0	Spriggs and Porter, Benalla
„	Vaux Hall ..	3·86	23·25	33·70	66·30	6 15 0	William Moore, Panmure
„	Lion	3·83	21·30	31·00	69·00	6 10 0	Alfred Wray, Sale

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Citrate In-soluble.	Phosphoric Acid. Total.	Potash.	Price asked for the Manure per ton.	Where Obtainable.
Containing Nitrogen, Phosphoric Acid, and Potash.		%	%	%	%	%	%	£ s. d.	
Horticultural Manure ..	M.L.	*4·50	11·00	0·42	0·49	11·91	3·00	9 0 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
Potato (with Bone) Manure	,, ...	1·65	8·50	0·25	6·55	15·30	2·50	7 0 0	,, ,, ,, ,,
,, Manure ..	,, ...	†1·40	14·50	0·58	0·42	15·50	2·00	6 7 6	,, ,, ,, ,,
,, ,, ..	Wischer and Co. ..	†1·33	14·62	0·43	0·43	15·48	2·00	6 7 6	Wischer and Co. Prop. Ltd., William-street, Melbourne
,, (with Bone) Manure	,, ,, ..	1·35	8·50	1·60	6·10	16·20	2·50	7 0 0	,, ,, ,, ,,
Horticultural Manure ..	,, ,, ..	*4·50	11·26	0·33	0·33	11·92	3·00	9 0 0	,, ,, ,, ,,
Orchard Manure ..	,, ,, ..	†2·38	12·96	0·38	0·38	13·72	3·00	7 7 6	,, ,, ,, ,,
Potato Manure ..	Sickle (A) ..	1·55	8·00	2·90	5·28	16·18	2·50	7 0 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
,, ,, ..	,, (B) ..	†1·40	14·62	0·43	0·43	15·48	2·00	6 7 6	,, ,, ,, ,,
Orchard Manure ..	,, ...	†2·40	12·92	0·38	0·38	13·68	3·00	7 7 6	,, ,, ,, ,,
Horticultural Manure ..	,, ...	*4·50	11·22	0·33	0·33	11·88	3·00	9 0 0	,, ,, ,, ,,
Orchard Manure ..	M.L.	†2·65	13·00	0·37	0·38	13·75	3·00	7 7 6	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
Horticultural Manure ..	Federal H.M. ..	*4·50	11·20	0·33	0·33	11·86	3·00	9 0 0	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
Orchard Manure ..	Federal F.M. ..	*2·20	13·22	0·39	0·39	14·00	3·00	7 7 6	,, ,, ,, ,,
Potato Manure	Federal Potato ..	*1·50	14·00	0·41	0·41	14·82	2·00	6 7 6	,, ,, ,, ,,
Containing Nitrogen and Phosphoric Acid only.									
Grass-laying Manure ..	Federal G.L. ..	0·90	11·00	0·86	5·48	17·34	..	5 5 0	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne
Pea, Bean, and Clover Manure	Federal P.B. ..	*0·50	14·50	0·43	0·43	15·36	..	5 5 0	,, ,, ,, ,,
Topdressing for Grass Manure	Federal T.D. ..	*0·85	16·00	0·47	0·47	16·94	..	5 5 0	,, ,, ,, ,,
Rape Manure	Federal Rape ..	*2·00	13·00	0·38	0·88	14·26	..	5 10 0	,, ,, ,, ,,
Onion Manure	Federal M.G. ..	*2·50	12·80	0·38	0·38	13·56	..	6 7 6	,, ,, ,, ,,
Barley Manure	M.L.	†1·00	15·00	0·50	0·50	16·00	..	5 10 0	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
Citrus, No. 2, Mildura, Manure	,, ...	2·02	5·54	0·16	10·95	16·65	..	5 17 6	.. ..
Apricot and Peach, No. 2, Mildura, Manure	,, ...	*5·75	12·11	0·35	0·36	12·82	..	8 10 0	.. ..
Vine, No. 4, Mildura, Manure	,, ...	*9·20	9·18	0·27	0·27	9·72	..	10 17 6	.. .. ,, ..

List of Fertilizers Registered at the Office of the Director of Agriculture under the Fertilizers Act 1915—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.				Potash.	Price asked for the Manure per ton.	Where Obtainable.
			Water Soluble.	Citrate Soluble.	Citrate In-soluble.	Total.			
Containing Nitrogen, Phosphoric Acid, and Potash.		%	%	%	%	%	%	£ s. d.	
Leguminous Manure ..	M.L.	0·25	15·30	0·55	0·55	16·40	..	5 5 0	Mt. Lyell M. and R. Co. Ltd., Little Collins street, Melbourne
Vine, No. 2, Mildura, Manure	"	‡7 13	9·18	0·27	0·27	9·72	..	9 7 6	" " " "
Grass Manure, Topdressing	Sickle	‡0·77	16·15	0·47	0·48	17·10	..	5 5 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
Grass Manure	"	0·55	11·05	0·32	7·88	19·25	..	5 5 0	" " " "
Maize Manure	"	†2·35	14·62	0·43	0·43	15·48	..	6 7 6	" " " "
Onion Manure	"	†2·30	13·60	0·40	0·40	14·40	..	6 7 6	" " " "
Rape Manure	"	†2·00	13·00	0·39	1·61	15·00	..	5 10 0	" " " "
Key Fertilizer (Grass) ..	Wischer and Co. ..	†0·75	15·30	0·45	0·45	16·20	..	5 5 0	Wischer and Co. Prop. Ltd., William-street, Melbourne
Grass Manure	" " ..	1·00	11·47	1·09	3·59	16·15	..	5 5 0	" " " "
Rape Manure	" " ..	†1·31	15·09	0·44	0·44	15·97	..	5 10 0	" " " "
Leguminous Manure ..	" " ..	0·25	15·30	0·45	0·45	16·20	..	5 5 0	" " " "
Onion Manure	" " ..	†2·38	12·75	0·38	0·37	13·50	..	6 7 6	" " " "
Maize Manure	" " ..	†2·00	14·66	0·43	0·43	15·52	..	6 7 6	" " " "
Onion Manure	M.L.	†3·25	10·35	0·31	1·12	11·78	..	6 7 6	Mt. Lyell M. and R. Co. Ltd., Little Collins-street, Melbourne
Rape Manure	"	†1·10	15·00	0·55	1·15	16·70	..	5 10 0	" " " "
Laying Down Grass Manure	"	0·52	11·05	0·33	8·08	19·46	..	5 5 0	" " " "
Topdressing Grass or Lawn Manure	"	0·98	12·00	3·12	0·36	15·48	..	5 5 0	" " " "
Maize and Fodder Crop Manure	"	§3·10	11·84	0·35	1·42	13·61	..	6 7 6	" " " "
Leguminous Manure ..	Sickle	0·25	15·30	0·55	0·55	16·40	..	5 5 0	Cuming, Smith, and Co. Prop. Ltd., William-street, Melbourne
Mildura, Vine, No. 2, Manure	"	‡7·13	9·18	0·27	0·27	9·72	..	9 7 6	" " " "
Mildura, A. and P., No. 2, Manure	"	‡4·45	12·11	0·35	0·36	12·82	..	7 12 6	" " " "
Mildura, Vine, No. 4, Manure	"	*9·20	9·18	0·27	0·27	9·72	..	10 17 6	" " " "
Mildura, Citrus, No. 2, Manure	"	2·02	5·52	0·16	10·96	16·64	..	5 17 6	" " " "
Maize Manure	Federal M.Z. ..	†3·00	11·20	0·93	2·73	14·86	..	6 7 6	Australian Explosives and Chemical Co. Ltd., William-street, Melbourne

* Containing Nitrogen as Ammonium Sulphate.
† Containing Nitrogen mainly as Ammonium Sulphate.
‡ Containing Nitrogen as Nitrate of Soda.
§ Containing Nitrogen as Ammonia, Nitrate, and Organic.

Melbourne, 3rd December, 1915.

P. RANKIN SCOTT,
Chemist for Agriculture.

Fertilizers Act 1915.

LIST SHOWING RESULTS OF ANALYSIS OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN VICTORIA UNDER THE PROVISIONS OF SECTION 27 OF THE FERTILIZERS ACT 1915 (6 GEO. V. No 2652).

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.								Price asked for the Manure per ton.	District in which Sample was obtained.
				Found.	Guaranteed.	Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Citrate Insoluble. Found.	Citrate Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.		
			%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
901	"Hasell's" Bone and Superphosphate (¼ and ¾)	A. H. Hasell ..	5·14	1·05	0·80	12·09	12·75	1·62	1·00	5·68	5·50	19·39	19·25	5 4 0	Metropolitan
902	,, ,,	,, ,, ..	4·21	0·50	0·80	13·36	12·75	2·35	1·00	3·95	5·50	19·66	19·25	5 4 0	..
1247	"Wischer's" No. 1 Superphosphate	Wischer and Co. ..	9·70	..	..	17·20	17·00	0·74	1·00	1·52	2·00	19·55	20·00	4 7 6	..
1248	"Sickle" Florida Superphosphate	Cuming, Smith, and Co.	9·77	..	..	17·47	17·00	1·15	1·00	1·92	2·00	20·54	20·00	4 7 6	..
1249	"Hasell's Bone and Superphosphate (¼ and ¾)	A. H. Hasell ..	5·25	1·92	1·50	8·28	8·50	2·81	0·50	5·45	9·50	16·54	18·50	5 11 6	..
1250	"Sickle" Bone and Superphosphate Mixed (A)	Cuming, Smith, and Co.	9·33	1·30	1·50	12·91	8·50	1·57	3·50	4·34	6·00	18·82	18·00	5 12 6	..
1251	"Mt. Lyell" No. 1 Superphosphate	Mt. Lyell M. and R. Co.	8·54	..	..	17·12	17·00	0·86	1·00	1·67	2·00	19·65	20·00	4 7 6	..
1252	"Wischer's" No. 1 Superphosphate	Wischer and Co. ..	9·92	..	..	17·29	17·00	1·54	1·00	1·36	2·00	20·19	20·00	4 7 6	..
1253	"Mt. Lyell" No. 1 Superphosphate	Mt. Lyell M. and R. Co.	7·50	..	..	16·23	17·00	0·70	1·00	2·13	2·00	19·06	20·00	4 7 6	..
1254	"Mt. Lyell" No. 1 Bone Fertilizer and Superphosphate	,, ,, ,,	6·15	1·78	1·50	7·85	8·50	5·20	3·50	4·77	6·00	17·82	18·00	5 12 6	..
1255	"Sickle" Florida Superphosphate	Cuming, Smith, and Co.	9·57	..	..	17·41	17·00	1·55	1·00	1·40	2·00	20·36	20·00	4 7 6	..
1256	"Hasell's" Superphosphate	A. H. Hasell ..	8·80	..	..	16·81	17·50	1·25	0·50	1·88	2·00	19·94	20·00	4 7 6	..
1257	"Wischer's" No. 1 Superphosphate	Wischer and Co. ..	9·15	..	..	16·67	17·00	0·55	1·00	1·96	2·00	19·18	20·00	4 7 6	..
1258	,, ,, ,,	,, ,, ..	9·17	..	..	16·67	17·00	0·70	1·00	2·04	2·00	19·31	20·00	4 7 6	..
1259	"Sickle" Florida Superphosphate	Cuming, Smith, and Co.	10·47	..	..	17·17	17·00	1·00	1·00	2·31	2·00	20·48	20·00	4 7 6	..
1260	"Sickle" *Dissolved Bone* and Superphosphate	,, ,, ,,	9·26	0·93	1·00	14·06	10·01	1·48	3·88	5·05	5·48	20·59	19·37	5 10 0	..
1261	"Mt. Lyell" No. 1 Superphosphate	Mt. Lyell M. and R. Co.	9·32	..	..	17·28	17·00	0·90	1·00	2·05	2·00	20·23	20·00	4 7 6	..
1262	,, ,, ,,	,, ,, ,,	7·66	..	..	17·49	17·00	0·77	1·00	2·07	2·00	20·33	20·00	4 7 6	,,

LIST SHOWING RESULTS OF ANALYSIS OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN VICTORIA UNDER THE PROVISIONS OF SECTION 27 OF THE FERTILIZERS ACT 1915 (6 GEO. V. No. 2652)—*continued.*

Label No.	*Description of Manure.*	Manufacturer or Importer.	MOISTURE	NITROGEN.		PHOSPHORIC ACID.								Price asked for the Manure *per ton.*	District in which Sample *was obtained.*
						Water Soluble.		Citrate Soluble		Citrate Insoluble		Total.			
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.		
			%	%	%	%	%	%	%	%	%	%	%	£ *s.* *d.*	
1263	"Wischer's" No. 1 Superphosphate	Wischer and Co. ..	7·01	..	..	17·14	17·00	1·18	1·00	1·98	2·00	20·30	20·00	4 7 6	Warracknabeal
1266	"Sickle" Florida Superphosphate	Cuming, Smith, and Co.	10·26	..	..	16·58	17·00	1·71	1·00	1·58	2·00	19·87	20·00	4 7 6	,,
1267	"Elsworth's" *Bone Fertilizer*	J. R. Elsworth ..	7·04	3·64	2·50	..	..	7·52	6·00	13·15	11·00	20·67	17·00	5 15 0	Ballarat
1268	"Sickle" Bone Fertilizer	Cuming, Smith, and Co.	5·27	3·25	3·00	..	..	0·56	3·00	11·00	13·00	17·56	16·00	6 2 6	Beaufort
1269	"Hasell's" Superphosphate	*A. H. Hasell* ..	6·20	..	..	18·19	17·50	1·09	0·50	1·01	2·00	21·19	20·00	4 7 6	Warracknabeal
1271	"Sickle" Blood, Bone Fertilizer and Superphosphate Mixed (B)	Cuming, Smith, and Co.	7·52	2·66	2·50	8·53	8·50	6·65	2·00	4·27	7·00	19·45	17·50	6 5 0	*Ararat*
1272	"Hasell's" Superphosphate	A. H. Hasell ..	1·99	..	..	18·73	17·50	1·14	0·50	1·52	2·00	21·39	20·00	4 7 6	Murtoa
1274	"Ark" Bone Fertilizer ..	*A. Murphy*	7·89	4·06	3·72	..	..	5·69	3·98	11·16	12·90	16·85	16·88	6 0 0	Ararat
1275	"Mt. Lyell" No. 1 Superphosphate	Mt. Lyell M. and R. Co.	6·06	..	..	16·51	17·00	1·15	1·00	1·67	2·00	19·33	20·00	4 7 6	*Horsham*
1276	,, ,, ,,	,, ,, ,,	7·73	..	..	18·12	17·00	1·08	1·00	1·91	2·00	21·11	20·00	4 7 6	Murtoa
1277	"Sickle" Bone Fertilizer and Superphosphate *Mixed* (A)	Cuming, Smith, and Co.	8·17	3·22	1·50	11·32	8·50	1·25	3·50	6·63	6·00	19·20	18·00	5 12 6	Ballarat
1278	"Hasell's" Superphosphate	A. H. Hasell ..	6·68	..	..	18·36	17·50	1·11	0·50	1·27	2·00	20·74	20·00	4 7 6	Horsham
1279	"Wischer's" No. 1 Superphosphate	Wischer and Co. ..	7·90	..	..	16·09	17·00	1·03	1·00	3·10	2·00	20·22	20·00	4 7 6	,,
1280	"Sickle" *Bone Fertilizer*	Cuming, Smith, and Co.	6·63	3·21	3·00	..	..	6·84	3·00	12·19	13·00	19·03	16·00	6 2 6	Ballarat
1281	"Federal" Superphosphate O.S.	Australian Explosives and Chemical Co.	7·84	..	..	18·19	17·00	0·79	1·00	1·05	2·00	20·03	20·00	4 7 6	Stawell
1282	"Federal" Bone Fertilizer and Superphosphate (B.S. No. 1)	Australian Explosives and Chemical Co.	3·69	1·39	1·50	11·29	8·50	4·02	3·50	4·40	6·00	19·71	18·00	5 12 6	,,
1283	"A.N.A. Surprise" Animal Fertilizer	G. W. Pennell ..	8·10	3·35	3·00	..	..	7·14	4·00	13·00	12·00	20·14	16·00	6 0 0	Metropolitan

List Showing Results of Analysis of Samples of Artificial Manures Collected in Victoria under the Provisions of Section 27 of the Fertilizers Act 1915 (6 Geo. V. No. 2652)—*continued*.

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.								Price asked for the Manure per ton.	District in which Sample was obtained.
						Water Soluble.		Citrate Soluble.		Citrate Insoluble.		Total.			
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.		
			%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
1284	"Sickle" Florida Superphosphate	Cuming, Smith, and Co.	7·40	..	..	16·85	17·00	0·90	1·00	2·00	2·00	19·75	20·00	4 7 6	Metropolitan
1285	"Mt. Lyell" Blood and Bone Fertilizer (A)	Mt. Lyell M. and R. Co.	7·44	4·97	5·00	..	..	8·35	3·00	10·34	12·00	18·69	15·00	7 0 0	,,
1286	"Mt. Lyell" No. 1 Bone Fertilizer and Superphosphate	,, ,, ,,	7·30	1·46	1·50	8·98	8·50	6·64	3·50	2·64	6·00	18·26	18·00	5 12 6	,,
1287	"Mt. Lyell" Blood and Bone Fertilizer (A)	,, ,, ,,	7·31	5·31	5·00	..	..	6·97	3·00	9·54	12·00	16·51	15·00	7 0 0	Cheltenham
1288	"Sickle" Nitro-Superphosphate	Cuming, Smith, and Co.	9·40	2·66*	2·00	14·48	13·00	1·42	0·76	1·96	2·52	17·86	16·28	5 10 0	,,
1290	Bone Fertilizer	J. Cockbill	7·99	3·69	3·50	..	..	6·45	3·50	12·45	14·75	18·90	18·75	5 10 0	Moorabbin
1291	"Champion" Animal Fertilizer	J. Cooke and Co. ..	4·00	6·41	6·50	..	..	5·07	4·50	4·81	5·00	9·88	9·50	6 0 0	,,
1292	Bone Fertilizer	J. Cockbill	7·22	3·10	3·50	..	..	5·64	3·50	14·12	14·75	19·76	18·75	5 10 0	Ringwood
1293	"Sickle" Bone Fertilizer ..	Cuming, Smith, and Co.	8·16	3·48	3·00	..	..	10·95	3·00	8·94	13·00	19·89	16·00	6 2 6	,,
1296	,, ,, ,, ..	,, ,, ,,	7·24	3·09	3·00	..	..	9·60	3·00	9·77	13·00	19·37	16·00	6 2 6	Bayswater
1297	"Mt. Lyell" Blood and Bone Fertilizer (A)	Mt. Lyell M. and R. Co.	8·40	5·47	5·00	..	..	8·96	3·00	7·39	12·00	16·35	15·00	7 0 0	Burwood
1298	"Mt. Lyell" Bone Fertilizer (B)	,, ,, ,,	8·06	3·28	3·00	..	..	7·37	3·00	9·76	13·00	17·13	16·00	6 2 6	,,
1294	"Mt. Lyell" Onion Manure‡	,, ,, ,,	8·50	3·10†	3·00	10·79	10·35	1·86	0·61	2·13	2·04	14·78	13·00	6 7 6	Dandenong

* Containing 1·95 per cent. nitrogen as ammonia, and 0·71 per cent. organic nitrogen.
† Containing 1·22 per cent. nitrogen as ammonia, and 1·88 per cent. organic nitrogen.
‡ Guaranteed to contain 3 per cent. potash found to contain 2·91 per cent. potash.

Department of Agriculture,
Melbourne, 19th November, 1915.

P. RANKIN SCOTT,
Chemist for Agriculture.

INSPECTION UNDER THE ARTIFICIAL FERTILIZERS ACT.

Season 1914–15.

By P. R. Scott, Chemist for Agriculture, and W. C. Robertson, Supervising Analyst.

Owing to resignations from the staff and important special work carried out in the Laboratory during the past year, the usual thorough method of inspecting artificial manure stocks and consignments could not be undertaken.

However, during the course of the year approximately 50 samples of the various manures on the market were collected. The majority were obtained at the consigning station in the metropolis, but as a safeguard one or two flying visits were made to the country and samples taken *en route*.

In addition, numerous consignments were weighed when being consigned, and it is satisfactory to report that in every instance the guaranteed net weight was exceeded.

In one or two cases technical breaches were observed, and a note of warning despatched to the offender. Whilst technical offences of the Act are, speaking generally, lightly regarded by merchant, agent, and farmer, it should be remembered that they offer loopholes for the practice of fraud.

As an instance one particular case is cited. A consignment of artificial manure was noticed, each and every bag of which had a label affixed as required by the Act. A closer inspection of the labels, however, disclosed the fact that the net weight in pounds had been altered, the printed number being deleted and a pencil number substituted.

Alterations to the label cannot be permitted, simply because it opens up an avenue for fraud.

The samples collected comprise mainly "Superphosphates," "Bone Fertilizer and Super.," and "Bone Fertilizers"; but, in addition, samples of "Dissolved Bones and Super.," "Blood, Bone, and Super. mixed," "Nitro-Superphosphate," "Animal Fertilizer," "Blood and Bone Fertilizer," and "Onion Manure" were obtained.

In not one single instance did the analysis of these samples disclose any necessity to institute proceedings.

The following is a comparison of the average analytical result of the collected samples against the average guaranteed analysis, together with the comparative average value calculated on the season's unit values.

SUPERPHOSPHATES.

Average Guarantee.				Average Analysis of Collected Samples.			
Phosphoric Acid.				Phosphoric Acid.			
Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.	Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.
17·10	—·91	2·00	20·01	17·25	1·04	1·83	20·12

List Showing Results of Analysis of Samples of Artificial Manures Collected in Victoria under the Provisions of Section 27 of the Fertilizers Act 1915 (6 Geo. V. No. 2652)—*continued.*

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Phosphoric Acid. Water Soluble. Guaranteed.	Phosphoric Acid. Citrate Soluble. Found.	Phosphoric Acid. Citrate Soluble. Guaranteed.	Phosphoric Acid. Citrate Insoluble. Found.	Phosphoric Acid. Citrate Insoluble. Guaranteed.	Phosphoric Acid. Total. Found.	Phosphoric Acid. Total. Guaranteed.	Price asked for the Manure per ton.	District in which Sample was obtained.
			%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
1284	"Sickle" Florida Superphosphate	Cuming, Smith, and Co.	7·40	..	..	16·85	17·00	0·90	1·00	2·00	2·00	19·75	20·00	4 7 6	Metropolitan
1285	"Mt. Lyell" Blood and Bone Fertilizer (A)	Mt. Lyell M. and R. Co.	7·44	4·97	5·00	..	..	8·35	3·00	10·34	12·00	18·69	15·00	7 0 0	,,
1286	"Mt. Lyell" No. 1 Bone Fertilizer and Superphosphate	,, ,, ,,	7·30	1·46	1·50	8·98	8·50	6·64	3·50	2·64	6·00	18·26	18·00	5 12 6	,,
1287	"Mt. Lyell" Blood and Bone Fertilizer (A)	,, ,, ,,	7·31	5·31	5·00	..	..	6·97	3·00	9·54	12·00	16·51	15·00	7 0 0	Cheltenham
1288	"Sickle" Nitro-Superphosphate	Cuming, Smith, and Co.	9·40	2·66*	2·00	14·48	13·00	1·42	0·76	1·96	2·52	17·86	16·28	5 10 0	,,
1290	Bone Fertilizer	J. Cockbill	7·99	3·69	3·50	..	..	6·45	3·50	12·45	14·75	18·90	18·75	5 10 0	Moorabbin
1291	"Champion" Animal Fertilizer	J. Cooke and Co. ..	4·90	6·41	6·50	..	..	5·07	4·50	4·81	5·00	9·88	9·50	6 0 0	,,
1292	Bone Fertilizer	J. Cockbill	7·22	3·10	3·50	..	..	5·64	3·50	14·12	14·75	19·76	18·75	5 10 0	Ringwood
1293	"Sickle" Bone Fertilizer ..	Cuming, Smith, and Co.	8·16	3·48	3·00	..	..	10·95	3·00	8·94	13·00	19·89	16·00	6 2 6	,,
1296	,, ,, ,, ..	,, ,, ,,	7·24	3·09	3·00	..	..	9·60	3·00	9·77	13·00	19·37	16·00	6 2 6	Bayswater
1297	"Mt. Lyell" Blood and Bone Fertilizer (A)	Mt. Lyell M. and R. Co.	8·40	5·47	5·00	..	..	8·96	3·00	7·39	12·00	16·35	15·00	7 0 0	Burwood
1298	"Mt. Lyell" Bone Fertilizer (B)	,, ,, ,,	8·06	3·28	3·00	..	..	7·37	3·00	9·76	13·00	17·13	16·00	6 2 6	,,
1294	"Mt. Lyell" Onion Manure‡	,, ,, ,,	8·50	3·10†	3·00	10·79	10·35	1·86	0·61	2·13	2·04	14·78	13·00	6 7 6	Dandenong

* Containing 1·95 per cent. nitrogen as ammonia, and 0·71 per cent. organic nitrogen.
† Containing 1·22 per cent. nitrogen as ammonia, and 1·88 per cent. organic nitrogen.
‡ Guaranteed to contain 3 per cent. potash found to contain 2·91 per cent. potash.

Department of Agriculture,
Melbourne, 19th November, 1915.

P. RANKIN SCOTT,
Chemist for Agriculture.

INSPECTION UNDER THE ARTIFICIAL FERTILIZERS ACT.

Season 1914-15.

By P. R. Scott, Chemist for Agriculture, and W. C. Robertson, Supervising Analyst.

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As an instance one particular case is cited. A consignment of artificial manure was noticed, each and every bag of which had a label affixed as required by the Act. A closer inspection of the labels, however, disclosed the fact that the net weight in pounds had been altered, the printed number being deleted and a pencil number substituted.

Alterations to the label cannot be permitted, simply because it opens up an avenue for fraud.

The samples collected comprise mainly "Superphosphates," "Bone Fertilizer and Super.," and "Bone Fertilizers"; but, in addition, samples of "Dissolved Bones and Super.," "Blood, Bone, and Super. mixed," "Nitro-Superphosphate," "Animal Fertilizer," "Blood and Bone Fertilizer," and "Onion Manure" were obtained.

In not one single instance did the analysis of these samples disclose any necessity to institute proceedings.

The following is a comparison of the average analytical result of the collected samples against the average guaranteed analysis, together with the comparative average value calculated on the season's unit values.

SUPERPHOSPHATES.

Average Guarantee.				Average Analysis of Collected Samples.			
Phosphoric Acid.				Phosphoric Acid.			
Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.	Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.
17·10	—·91	2·00	20·01	17·25	1·04	1·83	20·12

The average price paid for the manure per ton was £4 7s. 6d., the average value of the samples collected was found to be £4 7s. 3d., and the average value calculated on the average guarantee £4 6s. 5d.

"Bone Fertilizer and Supers."

—	Nitrogen.	Phosphoric Acid.			
		Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.
Average guarantee ..	1·33	9.56	2·50	6·31	18·37
Average analysis of collected samples	1·58	10·76	3·18	4·73	18.67

The average price paid for the manure per ton was £5 10s. 3d., the *average value of the collected samples* £4 19s. 10d., and the average guaranteed value £4 12s. 6d.

Bone Fertilizers.

—	Nitrogen.	Phosphoric Acid.		
		Citrate Soluble.	Citrate Insoluble.	Total.
Average guarantee ..	3·13	3·55	13·15	16·70
Average analysis of samples *collected*	*3·42*	*7·40*	*11·39*	*18·79*

The average price paid per ton was £5 18s. 7d., the average value of samples collected was found to be £5 8s., and the average value, calculated on the average guarantee, £4 15s. 9d.

Only one sample of "Dissolved Bone and Super," was collected. The price charged was £5 10s. per ton, the value calculated on the analysis *of the sample* was £4 15s. 1d., and the value according to the guarantee £4 9s. 4d.

The single sample of "Nitro-Super.," sold at £5 10s. per ton, was valued at £4 17s. 7d., whilst the *calculated* value on the result of the analysis was found to be £5 15s. 10d. per ton.

Three samples of "Blood and Bone Fertilizer" were sold at the average price of £7 per ton, the guaranteed value was £6 11s., whilst the average actual value (average analysis of collected samples) was £7 4s. 11d.

In the single case of a complete or special fertilizer, viz., onion *manure, the price* charged per ton was £6 7s. 6d., the guaranteed value £5 10s. 2d., and the actual value calculated from the result of the analysis £5 19s. 4d.

The farmer should remember *that the* annual unit values are not based on the agricultural value of the different fertilizers. The unit values are distinctly and decidedly commercial, and they may be controlled by the manufacturers.

The Artificial Manures Act gives the procedure for calculating the unit values, and briefly it is as follows:—The Chemist for Agriculture, from the manufacturer's guarantee and declared prices as set out in the

annual registrations, computes, from the simple manures only, the average unit value of each constituent having a commercial value.

Whilst the present system has many disadvantages, the figures obtained from the samples of fertilizers collected this year are of more than ordinary interest.

Taking the case of the simple manure Superphosphate, it will be noticed that not only does the average guarantee and average analysis coincide almost exactly, but the difference between the price charged for the manure per ton and the average value computed from both guarantee and analysis result is only a matter of 1s.—that is to say, the farmer on an average has received full commercial value.

The maximum value calculated on analysis result was £4 13s. 10d., whilst the minimum was £4 1s. 9d. per ton.

Turning to the figures given under "Bone and Supers." we find a different story, for, whilst the average analysis compares more than favorably with the average guarantee, there is a marked difference in the commercial value. Commercially the average "Bone and Super." was valued at £4 19s. 10d., and whilst being guaranteed to be worth £4 12s. 6d., the price charged per ton was £5 10s. 3d. These figures mean that the farmer paid 10s. 5d. per ton for the labour entailed in mixing the two manures, viz., Bone Fertilizer and "Super." to produce "Bone and Super."

Again, in the case of "Bone Fertilizers," incorrectly termed the "Bonedust Substitute," we find the average guarantee much below the average analysis as found in collected samples, and yet the actual commercial value of the samples was found to be £5 8s. per ton, whilst the average price charged was £5 18s. 7d., and the guaranteed value £4 15s. 9d.

In the case of "Nitro Super." and "Blood and Bone Fertilizers," it will be observed that the farmer came out with a credit balance of some 5s., whereas the samples of "Dissolved Bone and Super." and "Onion" manure show a commercial loss of from 8s. to 15s.

Summed up briefly, this year's figures advise farmers to buy Superphosphate, Blood and Bone Fertilizer, and Nitro-Superphosphate; but, as the commercial value is subject to alteration from year to year, no hard-and-fast rule can be laid down.

It follows that the farmer, in asking to be supplied with "mixed" or "special" fertilizers, is fully aware of the extra trouble and labour entailed in their preparation, and consequently knows full well that he will have to pay for it.

Taking Bone Fertilizer and Superphosphate mixed in the proportion of 1 : 1 (½ and ½), if the farmer buys the manures singly and mixes them himself, he will save 7s. 6d. per ton. This is the price charged for the labour of mixing.

In the case of "Complete" and "Special" Fertilizers, this figure is considerably higher.

A word on the practice of manuring with mixed manures. No experiments have as yet been undertaken by the Agricultural Department in the matter of manuring with these manures, and, taking the potato or onion crop as an example, it is a moot point as to whether the potato and onion manures on the market will produce any additional profit over and above that produced by the simple manure superphosphate

alone. The outcome of appreciable dressings of Potash or Nitrogen fertilizers, or both in conjunction with the usual dressing of superphosphate, is a horse of another colour.

Taking into consideration the fact that the simple manures as a general rule analyze well, both as regards fertilizing constituents and value, the farmer is well advised who orders simple manures only, and compounds these on the farm as occasion demands.

FARMERS' FIELD DAY.

RUTHERGLEN EXPERIMENTAL FARM.

19th November, 1915.

(Abridged from the *Rutherglen Sun.*)

The Department of Agriculture should feel proud at the unqualified success of the 1915 field day at the Rutherglen Experimental Farm (Viticultural College), on Friday, 19th November. Looked at in every way, it was just what one would desire for such a gathering. The weather was ideal; the attendance surpassed all expectations; the staff had everything ready; the season was favorable; the crops looked well, some exceptionally well, and this gave the demonstrator the best of opportunities to give the farmers a great object lesson, by explaining the different periods at which the different blocks were sown, and the different conditions that existed, thus demonstrating clearly how mistakes may be avoided.

There were fully 500 people present, the great majority of whom were farmers, and interested in cereal growing. It was not a gathering of local growers only; farmers were present from Albury, Howlong, Balldale, and Corowa (N.S.W.), Rutherglen, Chiltern, Barnawartha, Wodonga, Springhurst, Wangaratta, Taminick, Boorhaman, Norong, Yarrawonga, and Gooramadda districts.

Proceedings were timed to commence at 1.45, but the visitors began to assemble long before that hour; and when Hon. J. Bowser, M.L.A., announced that the Minister of Agriculture, Mr. Hageltborn, had been detained in Melbourne, owing to his presence being required at a meeting of the Wheat Harvesting Committee, there must have been fully 400 present. Among the visitors were Dr. Cherry, Professor of Agriculture; Mr. P. J. Moloney, M.H.R.; Hon. J. Bowser, M.L.A.; Mr. Temple Smith, Chief Field Officer; three representatives of the Melbourne weekly papers, and leading district residents. The visitors were received by Mr. A. E. V. Richardson, Agricultural Superintendent; Mr. G. H. Adcock, Principal of the Viticultural Station; and Mr. G. Harmer, Farm Manager. After the arrival of the party from Melbourne, no time was lost.

Welcome to Visitors.

Hon. J. Bowser stated that, in the absence of the Minister, he had great pleasure in extending a hearty welcome, on behalf of the Agricultural Department, to all present. He regretted that the Minister for

Agriculture, Mr. Hagelthorn, had been unavoidably detained at a meeting of the Wheat Conference. It had been the Minister's intention to have been present and explain what had been done in reference to the handling of wheat during the present season. The Minister would have been delighted to have met so many residents of the district. It was a big question that the Minister was detained on, and he (Mr. Bowser) trusted that the deliberations of the conference would be to the general benefit of the producer. He had pleasure in calling upon Mr. Richardson, Agricultural Superintendent, to explain the programme of inspection.

Mr. A. E. V. Richardson, Agricultural Superintendent, stated that he had pleasure in welcoming the visitors on behalf of the Department of Agriculture. This was the third annual field day held at the farm, and the attendance showed that a big interest was being taken in the work. Since the last field day, two rainfall records had been established. 1914 was absolutely the driest season ever recorded—only 4½ inches of rain

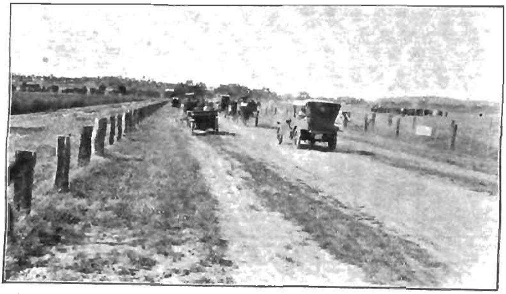
Portion of Crowd assembling at Woolshed on Field Day, Rutherglen State Farm.

fell in the growing period. This year was absolutely the wettest winter experienced at Rutherglen, as no less than 17½ inches had fallen in the winter months. In one season the crops are starved for want of water; in another they are flooded out. He thought that those who were present two years ago would see that many changes had taken place. Since the last gathering 580 acres of land had been cleared, and at present 860 acres of the 1,100 held by the College were now under cultivation. During the same period 8 miles of fencing had been erected, sheep-yards and woolshed built, and water storage and dams have been provided in each paddock. During the present season 624 acres were sown, consisting of 410 acres of seed wheat, 116 acres of oats, 47 acres of barley, 41 acres of forage crops, whilst 237 acres are devoted to pasture and 202 acres to fallow. He would ask the visitors to accompany him on a tour of

inspection through the various wheat fields. The work undertaken at Rutherglen comprised ten distinct sections. Apart from the bulk wheat plots which were sown to provide seed wheat true to name for distribution among farmers, there were a series of plots dealing with such practical problems as (1) the top-dressing of pastures; (2) the improvement of cereals; (3) permanent rotation plots; (4) permanent fertilizer trials; (5) cultural and tillage trials; (6) variety wheat, oat, and barley trials; (7) feeding off tests; (8) green manure tests; (9) soil moisture and soil nutrition tests. The outstanding features that would probably appeal forcibly to every one who inspected the crops may be stated as follows:—

1. The remarkable improvement effected in the stock-carrying capacity of poor North-Eastern land by continuous treatment with superphosphate and small dressings of lime. The results are so apparent to the eye that they could not fail to convince every practical farmer present.

2. The superiority in appearance and in probable net returns of wheat grown in rotation with forage crops fed down by sheep to every other form of crop rotation.



Visitors inspecting Pasture Top Dressings, Rutherglen State Farm, November, 1915.

3. The value of lime as a soil ameliorator, both on crops and on grass in normal or wet seasons in typical North-Eastern country.

4. The value of heavy dressings of phosphates for profitable wheat-growing.

5. The success of all early-sown crops.

6. The superiority of mid-season and late-maturing varieties, such as Penny, Yandilla King, &c., in seasons such as those we have just passed through.

The Inspection.

By this time there were about 500 present, who accepted Mr. Richardson's invitation to inspect the plots. The procession through the fields was a long one, and 135 vehicles, including motors, drags, cabs,

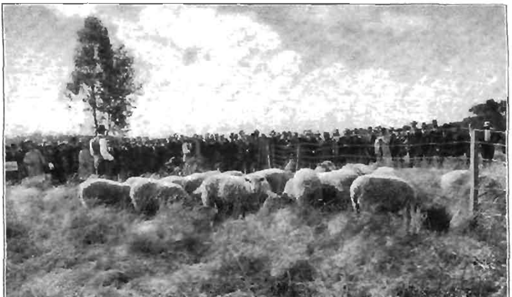
buggies, and gigs, were counted passing through a gate leading from one paddock to another. At one period, while an 80-acre paddock was being inspected, it was entirely surrounded by vehicles, and was an imposing sight.

What the Farmers Saw.

THE BULK CROP.

The bulk crops, comprising 600 acres, looked very imposing, being beautifully headed, free from weeds, and well laden with grain, and excited most favorable comment from the visitors. Special interest was evinced in a particularly fine crop of Penny wheat. Other wheats showing remarkably well were the late-maturing varieties like Yandilla King, Marshall's No. 3, Currawa, and Dart's Imperial.

All oat crops, comprising over 120 acres, were particularly heavy, and astonishment was expressed on all sides as the long line of vehicles drove between an avenue of succulent well-headed Algerian oats standing 6 feet high, the average yield of which was estimated by farmers present to exceed 3 tons of hay per acre.



Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, demonstrating to Farmers the value of Top-dressing Pastures and showing how Stock-carrying Capacity is increased by the application of Superphosphate, Rutherglen State Farm.

THE PASTURES.

The outstanding feature of the afternoon was the interest manifested in the pasture top dressings. Wherever phosphates, in the form of super. or basic slag was applied to the natural pasture, an extraordinary impetus was given to the growth of clovers and trefoil, and the stock-carrying capacity of the pasture was more than doubled.

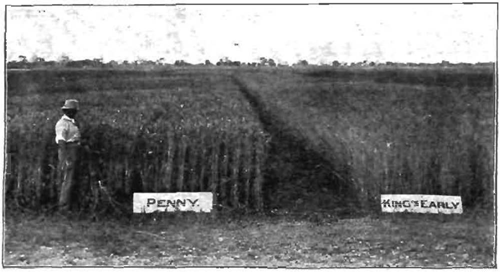
As one practical farmer expressed himself on witnessing the result of the dressing—"The addition of a few hundredweight of super. or

basic slag has transformed this poor, natural pasture into grazing land equal to that of the Western District or Gippsland." The sight of the dense mat of clovers and trefoils on the plot treated with 1 cwt. of super. and 10 cwt. of lime, as compared with the paucity of herbage on the untreated plot, will long live in the memory of those who had the privilege of witnessing it.

This demonstration was one of the most convincing of the afternoon, and was a general topic of conversation subsequently. The bearing of this experiment as a profitable business proposition can hardly be exaggerated. It means that by the addition of a few hundredweight of super., supplemented with an application of lime, millions of acres of naturally poor grazing country in the north-east would be enhanced in value, and the stock-carrying capacity increased almost beyond belief.

STUD CEREALS.

Great interest was manifested in the stud cereal section, which was really a nursery where new cereal creations were being evolved.



Plots showing method of Testing the Yielding Capacity of Varieties of Wheat, Rutherglen State Farm.

Here could be seen, in all stages of development, crossbred wheats of great promise. The long, square, compact heads of some of the new crossbred wheats appealed to the farmers with convincing force. A cross of Indian F. on Federation looked particularly well, and compared more than favorably with Federation plots grown alongside as checks.

The study of this section was greatly added to by a blackboard demonstration and lecturette by Mr. Richardson, explaining how wheats are crossed and the results of the crossing, and a practical demonstration by Mr. T. M. Whelan, the wheat expert, showing how the pollen was transferred from one wheat to another.

SOIL TEMPERATURE AND EVAPORATION TESTS.

In railed enclosure was an array of meteorological instruments, and the bearing of soil temperatures, evaporation, and transportation tests on ordinary farm practice was concisely demonstrated. The water

requirements of various farm crops—that is, the amount of water required to produce one ton of hay or one bushel of wheat—was being tested in a series of pot tests, as well as the methods by which the soil moisture could be conserved and economized.

Mr. Richardson further explained that from the records already taken, one inch of rain, if it could be all utilized by the crop and none lost in evaporation from the soil, would produce 2.5 bushels of wheat, 3.6 busbels of barley, 1.8 bushel of oats, and 2.6 bushels of peas. It would be seen from these figures the immense improvement possible in Victorian agriculture. The great part of the wheat area of Victoria has a rainfall of 10 inches in the growing period of wheat. By careful fallowing we find, by actual field tests, that in normal seasons an extra 3 or 4 inches of rain can be conserved from the preceding year. This brings the average effective rainfall up to 13-14 inches. Under the best conditions of farming, however, about one-third of the soil moisture is lost in evaporation during the growing period; consequently, this leaves 9 inches of water to be actually used by the crop. This is sufficient for an average yield of 22½ bushels of wheat per acre. The average yield of Victoria is less than half this, however, from which it may be inferred that much improvement can be made in our average farm practice before we approach the limit of our soil resources. Although the tests were only commenced this year, it is already evident that the application of soluble phosphates, especially in moderately heavy dressings, makes the plant more economical in its use of water, and this probably explains why such a small dressing of super. as 56 lbs. has such an extraordinary effect in raising our wheat yield. The superphosphate most probably has the effect of increasing the concentration of the soil solution to such an extent that the plant does not need to take in such large quantities of soil water to get the necessary phosphate for building up its tissue.

POT CULTURE EXPERIMENTS.

In a newly-erected pot culture house at the main buildings 150 pots were devoted to the determination of the water requirements of all our farm crops, weeds, and native grasses, and how far the water supply of the soil can be economized by the use of varying types of fertilizers and the methods of cultivation.

PERMANENT ROTATION PLOTS.

These plots conveyed their lessons very clearly, even to the lay mind. One outstanding feature was the superiority of wheat crops grown in rotation, with forages fed off, over wheat grown after cereals, or even bare fallow. This should be a source of satisfaction to farmers in this district, in that it enables the non-productive fallow to be dispensed with, and at the same time improving the yields of their regular crops. The practice on the farm was to sow down crops like rye and vetches, rape, peas, and barley, feed them down closely well into the spring, after which the land is worked up as a fallow for sowing wheat the following winter.

FORAGE CROPS.

These crops not only assisted in improving the fertility of the soil, but also showed a considerable profit due to their grazing value.

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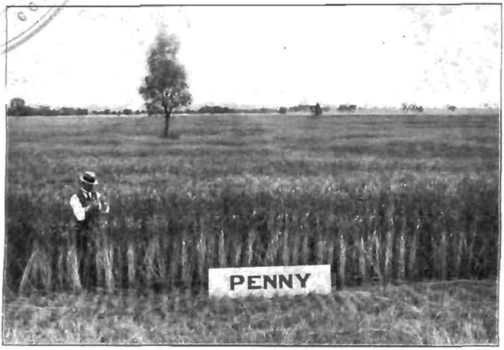
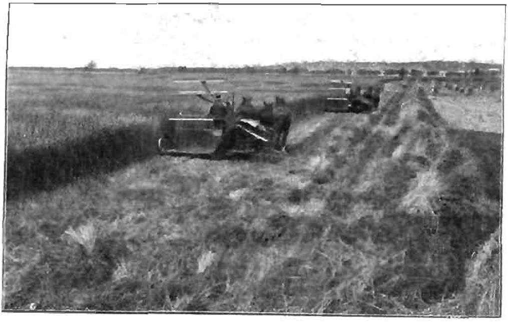
An Early and Late Study.

The early and late sowing tests demonstrated very clearly the advantages of early sowing in a season such as that through which we are



View of Bulk Wheat Fields, Rutherglen State Farm, showing Varieties grown for Seed Purposes for distribution to Farmers.



Binders at work on heavy crop of Algerian Oats, Rutherglen State Farm.

assing. It was noticeable, too, that early sowing, besides giving better rops, led to great economy in seed, for 60 lbs. of Federation seed sown n May gave an equally thick crop as 90 lbs. sown early in July. More-

over, the early sown plots, by reason of the fact that they get their roots well down into the subsoil while the soil temperatures are congenial, give *increased growth, which can be fed off by sheep with advantage during* the winter months when feed is so often scarce.

Fertilizing Tests.

The permanent fertilizer tests showed evidences of water-logging in parts. Still, the lesson they convey is clear and unmistakable. Superphosphate, especially of dressings from 1 to 2 cwt., is still showing superiority over all other phosphatic manures.

Plots treated with lime in quantities ranging from 5 to 10 cwt. per acre, especially when supplemented with 1 cwt. super., are showing up in marked contrast with unlimed sections.

Nitrogenous fertilizers have shown little effect, possibly owing to the activity of the nitrifying organisms which work so actively in well cultivated fallows.

Variety and Selection Wheat Plots.

These plots are in reality the testing ground and nursery of the bulk wheat plots, and were next examined. The prolificacy of the bulk wheats on the farm is kept up by a process of continuous and uninterrupted selection in the smaller variety and selection plots. Seventeen varieties, all of high merit, were here seen growing side by side. The produce from these plots will furnish next season valuable seed to replenish the farm stocks, and will ultimately be distributed among farmers as select bred seed.

Other Plots.

Green manurial and feeding off tests were showing the same differences as were noticeable on the permanent rotation field. The effect of the prior treatment with forage crops on the present season's wheat is remarkable.

Among many other features of interest were plots of selected malting and feeding barleys, oat varieties, and eight different varieties of peas.

Sheep.

Sheep men manifested interest in crossbred lambs sired by Suffolk, Shropshire, and Southdown rams, and a useful comparison as to their relative merits was thereby illustrated.

Afternoon Tea.

On returning to the woolshed, from where a start was made, every one was ready to accept the hospitality of the Department at afternoon tea, and it was thoroughly enjoyed.

The Speeches.

Mr. P. J. Moloney, M.H.R., stated that it had been a pleasure to him to accept the Minister for Agriculture's invitation to be present that day. He had given up another engagement to attend, and felt that he had been more than repaid. It had been an afternoon of instruction and a

surprise to him to see what was being done so thoroughly by the Department to assist the producer. Mr. Richardson had that afternoon explained everything so thoroughly that they all would leave with a knowledge of what was required to get the best results from the land. The crops were excellent, and the management generally were to be congratulated. He was sorry that the Minister was not present to give a *résumé* of what was being done in connexion with the big question—handling of the wheat harvest—as it would have been an opportune time. He was sorry that he was unable to give some reliable information, as the scheme was not yet fully developed. But he could say that it was necessary to do something in order that the grower was not exploited. It was not a party question, and he had been working with Mr. Manifold, Mr. Rodgers, and other country members to get the very best for the farmers. They had had several interviews with Mr. Hughes. This year it was estimated that there would be a yield of 150,000,000 bushels of wheat, which was an abnormal yield, as 100,000,000 bushels was

View of Hay Wheat Tests, Rutherglen State Farm.

estimated as the previous record yield. With this large increase of yield, and a decrease of 40 per cent. in shipping facilities, it was necessary to do something, as exporters would only have bought what they could ship away, and the farmer would then be left helpless; therefore, it was the duty of the Governments to do something and get the best possible bargain for the producer. It was proposed to advance the farmers 3s. f.o.b., less $3\frac{3}{8}$d. local charges. At normal times it was difficult to get the required shipping, and with a reduction of about 40 per cent. of bottoms available for oversea transit it was necessary to do something, otherwise there was the possibility of the farmers being exploited. The Government were advancing 3s. per bushel, less the $3\frac{3}{8}$d. charges, and in November there would be a dividend on the prices realized on the London market if present prices were maintained. Until the final decision of the Conference was arrived at, no definite information was available. Mr. Hughes had informed him that as speedily as possible

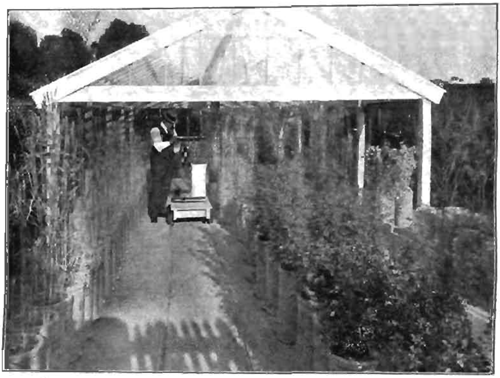
after the decision was finally arrived at a pamphlet would be issued and given to the press for publication. (Applause.)

Hon. J. Bowser, M.L.A., stated that the visit of inspection that day was a grand object-lesson of the value of the work being carried out in the interest of the producers by the Department, under the direction of Mr. Richardson and his officers—Messrs. Adcock, Harmer, and Whelan. It was the third gathering of this character that had been held at the College, and each year the gathering was growing in importance, and its utility was being impressed upon the public. It had been a fine lesson, showing what could be done by the application of science into practical work. The crops were a credit to the officials. To look at the pastures and see the results of top-dressing was quite a revelation, and made one begin to think what the resources of Australia were if they could put three or four sheep on to land where formerly there was only one. Besides the fine work that was being carried out by the

Haymaking.—Carting a heavy crop of Wheaten Hay (Huguenot), Rutherglen State Farm.

Department in the interests of the farmers and vine-growers, there was another branch—the social one—the training of the wards of the State to be practical agriculturists and viticulturists. It was the only institution of the kind in the State, and he had been informed that many of the lads who had been trained at the College had received good positions. These lads had been trained to be good citizens, and they had shown their appreciation of what the Department and Mr. Adcock, the Principal of the College, had done for them, and no less than 30 were either at the front or on their way there to uphold the honour of the Empire. (Applause.) He had to again express his regret at the absence of the Minister, but if the residents of the district wished to hear Mr. Hagelthorn's opinion on the wheat-handling question, he would be only too pleased to visit the district. Personally, he could not give details of the wheat-handling proposal of Australia until the

Conference of the Prime Minister and State Ministers had concluded their deliberations. But he understood that the final arrangement would be completed by Monday or Tuesday. He understood that the whole question turned upon the shipping freight available, which was 40 per cent. short. But whether the wheat could be handled better by the Government acting as a beneficent middleman, or by being dealt with through the ordinary channels, it was impossible to say until he knew the details of the scheme. But there was one thing, the grower would receive his 3s. per bushel, and in November a dividend if the prices of wheat were maintained on the London market; there was also a probability of the Government making a loss on the transaction. It was a great pity the producers were not organized in a thorough manner, so that they could speak definitely their requirements to the Government,

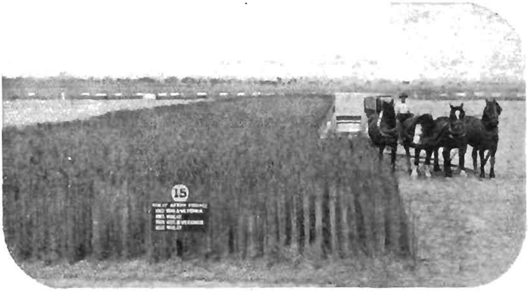


Pot Culture House, showing the method of determining the Water Requirements of Farm Crops, Rutherglen State Farm.

and assist in making their own arrangements. He would ask Professor Dr. Cherry to address the gathering. (Applause.)

Dr. Cherry stated that he wished to congratulate Mr. Richardson on the excellent wheat crops, which were produced under circumstances not altogether favorable. Some present would remember the establishment of the College, which was perched up on the hill with 80 acres of land. At a later date 800 acres were taken out of the forest reserve and added to the College lands. In this State, lands that were put into forest reserves were not good enough for anything else, and he believed it was generally termed third class land, which was poor land, and it was on this land that Mr. Richardson had worked. They had no doubt noticed during the day the value of using superphosphate drilled in with the seed. Other interesting studies had been the pastures and the cultiva-

tion of new varieties of wheat. In a season like this, when there was an estimated yield of 150,000,000 bushels, did they ever give time to reflect and consider what they were indebted to Mr. Farrer, of New South Wales, who, by experiments, had introduced Federation wheat, which was estimated to have increased the yields of wheat production 10 per cent. Mr. Richardson was working on correct lines, and it may eventually lead to the producing of a variety even more prolific than *Federation. In the production of the wheat yield large quantities of* phosphates were used, amounting to nearly £1,250,000 worth. The phosphates which they were putting into the ground were being sent away from the country, as most of it went into the wheat, and four-fifths of it go into bran and pollard. He strongly urged the keeping of the phosphates in the State, and why could we not export our harvest in the form of flour instead of wheat? It was known that Australian wheat produced the best bread in the world; therefore, why should Australia



Harvesting Experimental Plots, Rutherglen State Farm.

not do its own milling, export the flour, thus causing extra labour and preserving the bran and pollard, which could be utilized for stock feeding during the months when the pastures were low, namely, from February to April. (Applause.)

Cr. A. H. Stewart (Mayor, Rutherglen) stated that he had great pleasure in moving a vote of thanks to Mr. Richardson for the instructive demonstrations that he had given, and to Mr. Moloney, Mr. Bowser, and Dr. Cherry for their excellent addresses. It was the first occasion that he had attended a field day, and the afternoon had been very interesting, and showed what was being done in the interests of the producer.

Cr. Prentice, J.P., in seconding the motion, stated that it was evident that Mr. Richardson was working on lines that would produce the very best results, and in his work he was ably assisted by Messrs.

Adcock, Harmer, and Whelan. The experiments seen that day illustrated clearly how comparatively poor land could be made productive. He would ask that the vote of thanks be carried by acclamation. (Applause.)

Reply.

Mr. Richardson, in replying to the vote of thanks on behalf of the Department, stated that the success of the gathering was largely due to the excellent manner in which the staff, under Messrs. Adcock (Principal), Harmer (Farm Manager), and Whelan (Wheat Expert), had carried out their work. In reference to the shipment of wheat, he thought the Government was doing the best thing possible, in view of the abnormal conditions ruling in the freight market, and was certainly doing better than any private firms could possibly do. This was shown recently when the Imperial Government desired to commandeer fourteen transports; the Commonwealth Government stepped in, and pointed out that if Australia was to do its part in financing her share of this great war and maintain her own men, facilities would have to be available for the handling of the harvest, and the Imperial Government immediately released the transports for the conveyance of Australian wheat; this would certainly not have been done for any private firm. At present the wheat value was 57s. 6d. per quarter on the London market, equivalent to 7s. 3d. per bushel. The Governments were contemplating handling the whole wheat harvest with an advance of 3s. to the producer, less 3⅜d. charges. If the present price was maintained on the London market, after allowing for freight and other handling, the farmers' wheat would bring a price equal to 4s. 8d. per bushel, and in November the farmer would be getting an addition of 1s. 8d. per bushel on his 3s., which would be a very satisfactory result; but they had to remember that the figures he was giving was on present London prices being maintained. Nor was there any reason, in spite of the record American crop, why these prices should not be maintained. On the other hand, if the Government had not stepped in, farmers would be rushing to sell their wheat, agents would be unable to get shipping space, and with a big demand for space freights would go up and prices would fall. Those who got in early would probably get 3s. 9d. or 4s., but what price would the great masses of farmers get? In normal years freight was 30s., and now it was 85s. What would it go to if there was a rush for space with only 60 per cent. of the shipping available. He held no brief for the Government, but thought the scheme proposed would work out in the general interest of the producer. In reference to the 3⅜d. local charges, they had to remember that wheat shipped from Australia across the line increased considerably in weight, and the value of this increase would be credited to the pool, and would be a good set off against local charges. (Applause.)

The gathering then broke up with three cheers for the College officers and employees, and three for the boys in Gallipoli.

Commentary.

The farmers of the Rutherglen district who attended this field day were unforgettably impressed by the ocular demonstrations they witnessed, and obtained a practical conception of the new and rapid

developing era, aiming at enhanced agricultural production in the north-eastern corner of the State.

It is also clear that Farmers' Field Day bids fair to become a popular annual event at Rutherglen, and it is to be hoped that the departmental authorities will see their way clear to devote a whole day to future inspections and demonstrations.

VICTORIAN FRESH GRAPES AT THE PANAMA-PACIFIC EXPOSITION.

(*By F. de Castella, Government Viticulturist.*)

With a view to further testing the possibility of developing an export trade in fresh grapes on a large scale, advantage was taken of the opportunity presented by the Australian display made by the Commonwealth and several of the States at the recent Panama-Pacific Exposition. Victoria contributed a considerable quantity of fruit, portion of which consisted of grapes.

Seventy cases of grapes of proved shipping varieties were purchased by the Department of Agriculture. Of these, 62 were sent to the Exposition. The balance was retained in the Government Cool Stores for further observation. Fifty cases were grown by Mr. R. G. Cameron, of Merbein, near Mildura, and twenty by the late J. Grimmond, of Wahgunyah.

The Merbein grapes were mainly Ohanez, but comprised also Purple Cornichon, Flame Tokay, and Santa Paula. They were grown under irrigation. The Wahgunyah consignment consisted mainly of Waltham Cross, but included also Wortley Hall, Purple Cornichon, and Valensy. These were grown on a sand hill vineyard adjacent to the Murray, and were not irrigated. The fact that they stood the test so well after the disastrous 1914-15 summer is further proof of the well-known resistance to drought of vines grown on deep sandy soil.

The following particulars as to conditions under which the grapes were shipped may prove of use to intending exporters of grapes:—

The package used was the West Australian export grape case, which *contains 28 lbs. of grapes and nearly 5 lbs. of granulated cork filler.* The outside measurements are $23\frac{3}{4}$ x $14\frac{3}{8}$ x $7\frac{1}{4}$ inches, or 2,688 cubic inches. It has a transverse partition. The timber is white pine (undressed), the partition and ends being $\frac{5}{8}$ inch thick, whilst the bottom, sides and top are $\frac{7}{16}$ inch. By measurement there would be 25 cases to the ton of 40 cubic feet, or 53 cases, by weight, to the ton, on the following basis:—Grapes, 28 lbs.; cork, 5 lbs.; case, $8\frac{1}{2}$ lbs.; total $41\frac{1}{2}$ lbs. The internal capacity, exclusive of partition, is 1,890.84 cubic inches, or .84 bushel.

The *Merbein grapes were sent in two consignments; the first* (*eight* cases) leaving Merbein on the 25th February, and the balance on 4th

March. They both reached the Government Cool Stores two days later, being stored at a temperature of 32° F. until shipped. They were conveyed on the railways in ordinary trucks (not louvre), and were not cooled in any way. Both consignments were shipped to Sydney per the s.s. *Karoola,* of the Oceanic line, on 11th March, and there transhipped to the s.s. *Sonoma,* of same line, leaving Sydney for San Francisco on 13th March.

The Wahgunyah grapes were sent to Melbourne in a louvre truck *(not cooled in any way) on 16th March, going into* the Government Cool Stores the following day. They were shipped to Sydney by the s.s. *Karoola* on 8th April, being there transhipped to s.s. *Ventura* (Oceanic line) for San Francisco, which sailed on 10th April.

Arrangements were made for the grapes to be carried at a temperature not lower than 31° F., but not higher than 34° F. In the Government Cool Stores they were kept at 32°.

Freight charges were as follow (per ton of 40 cubic feet), Melbourne to Sydney, 25s.; Sydney to San Francisco, 60s.; transhipment at Sydney, 3s. 6d.; a total of £4 8s. 6d. per ton of 40 cubic feet, or 2s. 11½d. per case.

Reports concerning the fruit were received from Mr. C. K. Harrison the officer representing the Department of Agriculture at the Exposition, from which the following extracts refer to grapes:—

Writing on 7th June, he said—"All the grapes opened up very well indeed. The Purple Cornichons seem to be one of the best grapes sent over; at any rate, we are receiving a number of inquiries about this variety."

It may be mentioned that the grapes landed in San Francisco in better order than the apples.

Writing on 8th October, he said—"As Mr. de Castella made a request for a report on the general behaviour of the grapes which were on exhibit here, I now beg to supply you with this information. All our grapes arrived in good order, being well packed. The first lot to arrive included Ohanez, Purple Cornichon, Flame Tokay, and Santa Paula, and the second consignment comprised Waltham Cross, Wortley Hall, Purple Cornichon, and Valensy. On being opened up all the grapes were in very fair condition. The stalks of the Flame Tokay were somewhat shrivelled, likewise one case of the Purple Cornichon, but in flavour they were both good. The Waltham Cross seemed to have lost a good deal of their original flavour, and were, in my opinion, the least desirable of any in this respect. The grapes of this variety did not keep very well, they started to decay on one side of the case. As regards keeping quality, the Ohanez were easily first. These grapes kept almost in perfect condition up to the closing of the refrigerator, about ten days ago. I have still one case in the pavilion; they are sound and retain most of their flavour."

Mr. Harrison reports that, owing to a change in the staff, the detailed record kept at his request by the foreman was mislaid, so that most of his remarks are really the results as showing at the closing of the refrigerator and from memory.

As regards the cases which were kept back; it was intended to make a display with some of these at the Royal Agricultural Society's September Show, which, however, was not held. The grapes were

inspected at various dates, and for a considerable time they all kept in excellent order. On 30th June, at a lecture on grape shipment delivered at Mildura by the writer and Mr. W. French, Engineer in charge of Government Cool Stores, a sample of several varieties, mainly Ohanez, Waltham Cross, and Valensy, was exhibited. At this date all the varieties kept back were in excellent order. By the 9th August, however, when they were again examined, there was a marked difference between the Ohanez and all the other sorts, which showed more or less signs of deterioration, whereas the Ohanez were still in excellent order and perfectly marketable. The Waltham Cross from Wahgunyah were still good in flavour, but, owing to the presence of a few decayed and juicy berries, the condition was faulty. The Purple Cornichon were better than the Waltham Cross. Their main fault, after long storage, is the ease with which the berries fall off. They present the peculiarity of detaching at the stalk, but without any breakage of the skin, so that the other grapes do not become juicy as occurs with so many varieties. The Valensy kept in very fair order until 26th September, when the last of this variety was removed from the Cool Store. Flavour was still remarkably good, though appearance was somewhat faulty.

On the 12th October the last case of Ohanez were still in remarkably good order; so much so that some of them were taken to Mildura by the writer and exhibited at the lecture on 13th October, nearly seven months after their removal from the vine.

The result of the shipment confirms previous experience, which points distinctly to Ohanez being absolutely the best keeping grape known. It also shows that several other sorts, though not possessing the same keeping power, can be shipped to the other side of the world in marketable condition, in spite of the absence of refrigerated transport on the railways and transhipment at Sydney. Rectification of these defects would undoubtedly render possible the shipment of Muscats and other less resistant sorts.

A variety worthy of special mention is Valensy, which promises to surpass the well-known Doradillo as what might be termed a multiple-purpose grape; being oval, it is of more attractive appearance, and it seems to be quite as prolific a bearer. As a result of experiments conducted at the Rutherglen Viticultural Station, it is also proving superior to Doradillo for wine-making, and possibly also for distillation. Several Rutherglen growers who specialize in table grapes have formed a very high opinion of this variety, and are propagating it extensively. From the absence of special mention by Mr. Harrison, it appears to have stood the practical test of shipment better than Waltham Cross.

THE DAIRY COW AS A MACHINE.

By B. A. Barr, Senior Dairy Supervisor.

A machine is a contrivance which, if supplied with sufficient power, is able to perform work. By its use some of the potential energy of the fuel is transformed into work. The work performed by a milking cow is in the form of milk production.

To enable a machine to do work, it is necessary to supply it with sufficient motive power, such as steam, gas, petrol, electricity, &c., all of which possess varying capacities for work.

The dairy cow requires food as fuel, and just as the different fuels used to drive machines vary in value, so do the different foods available to the cow vary in their value for milk production.

Under similar conditions 1 ton of coal will perform a greater amount of work than 1 ton of wood, and similarly 1 cwt. of green oats will produce a larger quantity of milk than 1 cwt. of green maize, or 1 cwt. of bran will give a much greater return than 1 cwt. of lucerne hay. All the energy of the fuel which is burned in the furnace of a boiler or directed to the combustion chamber of a gas engine is not transformed into work. Some of the fuel is not completely burned, and some of the products of combustion escape in the air. This represents a considerable loss. In the most efficient internal combustion engine only 40 per cent. of the total energy of the fuel is transformed into work, and in many steam-driven plants not more than 10 per cent. is recovered. A similar loss results in feeding cows, when, according to the capacity of the individual animal, from 20 per cent. to 45 per cent. of the total energy of the fuel is transformed into milk. A portion of the food is not digested, and from this no milk can be secreted. Portion of the digested food is required to repair wastage and to maintain the body temperature. When wet cold food is given during cold weather a considerable amount of food is burned to raise up to body temperature the cold contents of the stomach. What is left after these demands is available for milk production.

The fuel supplied to a machine is used only for the production of work. When any part wears, either it is replaced by a duplicate or taken out, turned, and re-fitted; but in the case of the cow the food is converted into work and also keeps the machine in repair; in other words, whilst supplying the secretory cells of the udder with digested food-material for conversion into milk it also maintains the bodily condition and health of the animal.

The value of a fuel for driving a machine is determined by chemical means and by the rapidity and completeness of its combustion. The food value of a fodder may be somewhat similarly determined by its chemical constitution and its digestibility. Just as certain fuels give best results when directed to particular classes of work, so certain foods give best results for milk production. The dairy cow requires not only a larger amount of food, but also a different kind of food from that of the dry or fattening animal. The larger amount is required because the work performed is greater; the different kind is required because a different class of work is done.

In one case the food is used to promote an excessive development of flesh and fat tissue and in the other for conversion into milk.

If we were assured of a continuous growth of pasture grass throughout the year, in most cases hand-feeding would be a matter for small consideration; but, owing to seasonal influences, a plenteous supply is followed by periods of scarcity, and in so much as dairying is only profitable when a long milking season is secured, the grass needs to be supplemented by grown or purchased feeds.

The demand for additional feed usually comes in the early summer, to meet which maize and millet are usually grown, and complaint is made that these do not effectively check the decrease in the milk yield. Millet has a higher feeding value than maize; it also possesses the advantage of being easily grazed, whereby labour is saved, and, in addition, is available for use at an earlier period than maize. Maize yields a greater amount of fodder per acre, and any surplus can readily be made into silage. Where suitable conditions obtain both crops should be grown, but alone these do not meet the demands of a good milking herd at this particular period.

Usually when these fodders are fed the grass has shed most of its seed, and what remains in the paddock is a hard tough straw difficult to digest. The most valuable contents of the growing grasses have concentrated in the seed, which on ripening falls to the ground. Maize and millet do not contain, in the necessary amount and proportion, that nourishment of which the dried grass is deficient. For this reason each season the milk yield decreases more rapidly at this particular period than if sufficient suitable pasture or balanced feeds were available. To check this rapid decrease and to balance the maize and millet, some clover or lucerne, either green or as hay, should be given. To expect a cow to milk heavily when fed on a little dried grass supplemented by maize is as reasonable as asking oneself to perform hard and continued manual labour on a little dry bread supplemented by boiled cabbage. The reason in both cases is the same. The food does not contain the requisite constituents nor sufficient energy to do the work; and those constituents which the food contains are not present in that proportion which produces the best return. Should home-grown lucerne or clover not be available, in most seasons it pays to give a small amount of bran and pollard or gluten meal; say 2 lbs. bran and 1 lb. pollard, or 3 lbs. gluten meal daily in addition to the green fodder. Where maize is fed in the paddock, these may be given dry or mixed with a very small amount of chaff in the bails or in boxes. The above amounts must not be blindly used. The value of every ration depends upon the intelligence of the feeder. The amounts fed are determined by the price of butter fat, price of feed, and the amount of milk yielded by each cow. In many instances it is profitable to give a much greater amount, and in others a lesser amount will suffice. The object should be to maintain the milk flow, due allowance being made for the decrease resulting from the extending lactation period. If, as a result of the grass drying in the summer, the average decrease over one month be 8 lbs. per cow, of 4.5 per cent. milk, when butter fat is selling at 1s. per lb., the loss per cow will be 4d. per day. In other words, if, on 1st January the cows averaged 26 lbs. milk, and on 1st February averaged 18 lbs. per cow, each cow would be yielding ⅓ lb. of

butter fat less on the latter date than on the former, besides the loss in skim milk. This is a very frequent decrease, and in many cases much greater than in the case cited; in fact, in some districts, where the cows are forced to depend solely on grass, herds milking heavily in early January are almost dry in March, and are given four to five months' spell before calving. Under such conditions dairying is not profitable.

Now, if 4 lbs. bran at £4 10s. a ton be added to the maize or millet it would provide sufficient nourishment to check this decrease, and not only is this gained, but *a longer milking period is secured. The loss* of butter fat has a value of 4d., whilst the cost of 4 lbs. bran at £4 10s. a ton is 2d., leaving a gain of 2d. per day in addition to more skim milk and *an extended milking season.*

Each farmer has a good knowledge of his own district and when the pasture usually goes off. Just before this time hand-feeding should be commenced. It is easier and cheaper to maintain the flow than to increase it after a rapid decrease.

It is expedient to supply feed in such amounts that, at least, it will equal the amount of nutriment lost to the pasture. In supplying purchased feeds to dairy cows, select those that are easily digested, as such give a quicker return. The cost of digestion in some fodders is very high, and by this cost will the value for milk production be reduced. The variety of food purchased should be regulated by the price, the amount of digestible matter, and its digestibility.

The finer the condition of the food the more easily will it be digested. *At the same price* bran is always preferable to lucerne hay. When feeding bran to dairy cows the addition of a little pollard increases the value of the ration, but it must not be fed in such amounts that costiveness results. Its use is largely determined by the nature of the rest of the ration. Large amounts may be fed when the feed consists mainly of succulent food than when dry feeds comprise the bulk.

During winter months from ½ to 2 lbs. crushed linseed meal or coconnut oil cake may be added, according to yield. These contain a relatively high oily content, and are best suited for the production of body warmth during cold weather. Like a machine, the dairy cow should be kept working at her full capacity without over strain; since, in each case, it is under this condition that the greatest profit is made. *Just as a factory* with sufficient motive power to drive twelve machines at full pressure is more profitable than one with the same amount of power directed to twenty machines at half pressure, so the dairy herd *of twelve good cows well fed is more profitable* than twenty cows of the same quality underfed, whilst the initial cost and labour required is less.

It is only when the cow is getting as much food as she can transform into milk that she is milking her best, and in the fair-conditioned animal any excess above the requirement is shown by the animal increasing in condition.

RELATIONSHIP BETWEEN THE AVERAGE WHEAT YIELD AND THE WINTER RAINFALL.

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

That the Victorian average wheat yield is dependent on the rainfall during the growing period of the crop is a matter of common observation.

That there is a definite relationship between the two, and that this relationship may be used to forecast the probable average wheat yield early in November is probably not suspected by the casual observer.

A comparison of the average wheat yields of Victoria for the past 25 years with the composite rainfall over the wheat belt from May to October throughout the same period appears to establish such a relationship. In order to determine the composite winter rainfall of the Victorian wheat belt, ten typical stations were chosen, and the composite average rainfall from these centres expressed in inches of rain was compared with Victoria's yield in bushels per acre. An extraordinary coincidence resulted. During the 25 year period the composite winter rainfall expressed in inches of rain at these centres corresponded almost exactly with Victoria's average yield expressed in bushels per acre. Thus the average rainfall for the period was 9.5 inches, and the average yield per acre 9.1 bushels, or for every inch of winter rainfall approximately an average of 1 bushel of wheat per acre was obtained.

The centres chosen were ten in number, and represented the chief districts in which wheat is grown. The centres were Mildura, Ultima, and Beulah, representing the Mallee areas; Nhill, Horsham, and Donald, representing the Wimmera; Shepparton, Echuca, and Bendigo, representing the northern areas; and Rokewood, representing the Western District.

The Mallee, the Wimmera, and the northern districts produced in normal seasons roughly 30 per cent. each of the wheat yield, whilst the western and central districts produced the remaining 10 per cent.

The composite winter rainfall of these centres may be taken as representative rainfall of the chief wheat-growing areas of the State.

That wide fluctuations in the rainfall occur will be apparent on considering the graph, which summarizes the winter rainfall at these ten centres for the past quarter of a century. The lowest recorded winter rainfall was at Mildura in 1914, when .73 inches of rain fell in six months. The highest recorded winter rainfall at these centres was in 1906, at Shepparton, when 19.13 inches fell in the six winter months.

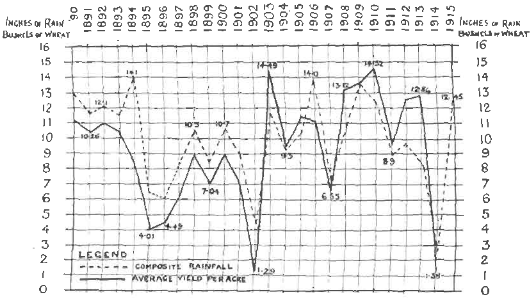
The accompanying graph expresses the variations in the composite winter rainfall in inches of rain, and the average yield in bushels per acre for each of the past 25 years. A close scrutiny of the graph will reveal a number of interesting facts.

Improvement in Victorian Agriculture shown graphically.

The outstanding feature of the graph is the improvement in efficiency in Victorian wheat growing during the past decade. This is shown not only in the improved averages reaped per acre, but more particularly in the number of bushels per acre won from each inch of available

rainfall. Now, the graph shows that the past 24 seasons may be divided conveniently into two periods of twelve years, each culminating in a disastrous drought. Curiously enough, the composite average winter rainfall for the first period is approximately the same as the composite average winter rainfall for the second period, namely, 9.5 inches and 9.8 inches respectively; but whereas the average yield per acre during the first period culminating in the 1902 drought was 7.4 bushels, the average yield for the second period culminating in last year's record drought was 10.88 bushels. Or, expressing the same facts in another way, whilst during the first period for every inch of winter rainfall our farmers secured .77 bushels of wheat per acre, in the second period they secured 1.12 bushels per acre for every inch of winter rainfall.

In other words, with similar soil and similar rainfall the farmers of the latter period secured 46 per cent. more wheat per acre than those of the former period.



Graph showing Relationship between the Average Wheat Yield and the Winter Rainfall.

And the graph shows this unmistakably. Note the relative positions of the dotted line representing the winter rainfall with the continuous line representing Victoria's average yield. For the twelve years prior to and including 1902 the rainfall line is consistently above the line representing yield per acre. In other words, during no single year during the first period did our farmers secure anything like an average yield of 1 bushel of wheat per acre for each inch of rain. But the drought of 1902 had its lessons. It synchronized with the introduction of superphosphates, the more general adoption of bare-fallowing, and more thorough methods of cultivation. 1903-1907 was the transition period when the value of the new practices that were revolutionizing wheat growing was being demonstrated. From 1907 onwards, with the single exception of 1914—the most disastrous drought within living memory—the line representing yield per acre is regularly above the

line representing the average rainfall. In other words, during this period farmers never reaped less than 1 bushel per acre for each inch of composite winter rainfall.

Lest it be supposed that we are approaching the limit of our production so far as yields per acre are concerned, it might be mentioned that carefully-conducted tests on the water requirements of wheat at Rutherglen during the past two years demonstrate that 1 inch of rain is capable of producing at least 2½ bushels of wheat, providing the whole of the water is used by the crop and none dissipated by evaporation.

At present, however, we in Victoria are securing less than half this amount, and the more widespread adoption of better methods of cultivation, systematic crop rotation, rational soil fertilization, and careful seed selection will gradually raise the average yield per acre until it approaches the above limit.

Effect of Abnormal Seasons and Crop Conditions.

The graph shows that the average yield per acre closely follows the composite winter rainfall. This is particularly true for normal seasons. Occasionally, however, we get an unusually wet season or a disastrous drought.

The two wettest winters on record during the period under review are 1894 and 1906. In both these years the composite rainfall exceeded 14 inches at the ten selected centres during the six winter months. Many of the crops were waterlogged during the winter months, and ultimately the yields were much lower than in seasons of normal rainfall.

During the two drought seasons, 1902 and 1914, there were whole districts where the crop was an absolute failure. The rainfall last year at Mildura during the six winter months was less than 1 inch. Little wonder that no crop was reaped.

Looking over the chart, it is apparent that the best average yield is obtained when the composite winter rainfall lies between 10 inches and 13 inches.

If a larger number of centres were chosen it is likely that the approximation of the graphs of rainfall and crop yields would be even closer. Absolute agreement could not be expected, however, for the reason that crop yields are dependent on other factors than rainfall, though rainfall is the dominating factor. For example, fungoid pests such as rust, smut, takeall, affect the crops in some degree every season, but in some years the seasonal conditions are highly favorable for fungus diseases, and heavy toll is levied on the wheat crops.

Again, the premature appearance of continuous hot winds just as the crop is filling depresses the yields. Untoward accidents, such as widespread heavy hailstorms and violent winds at the time of ripening of the crop, materially lower the yield. On the other hand, a long cool spring, with mild spring temperatures and opportune showers, as in the present season, following on a normal winter, would tend to unusually heavy crops. Finally, good seeding rains and early November rains have a stimulating effect on the crop averages.

Possibility of Forecasting the Crop.

If the influence of these factors be taken into consideration, it is apparent that the graph suggests a method of forecasting approximately

the average yield per acre early in November, and with a reasonable degree of approximation. Thus the winter rainfall at the selected centres can be determined on 1st November, and the composite rainfall multiplied by a given factor will give the approximate yield per acre. During the past twelve years the average yield for each inch of winter rainfall has been shown to be 1.12. It has already been shown that this factor must gradually increase as farming methods become more efficient.

Assuming, however, that this average ratio of the past twelve years will hold for this season, it means that the average yield per acre of Victoria for 1915-16 harvest will probably be $1.12 \times 12.45 = 13.94$ bushels per acre.

The advantage of such a method of forecasting the harvest lies in the fact that it can be used to gain an idea of the approximate harvest long before the ordinary official statistics published by the Government Statist and the Railway Department are available. Moreover, the only data required is the rainfall figures for the ten centres. Early in November it was necessary to gain an approximate estimate of the wheat crop of Victoria, in order to allocate freights under the Commonwealth Wheat Marketing scheme.

As official statistics showed that the area to be cut for grain would be 3,800,000 acres, the Agricultural Department estimated the new crop on 7th November at $3,800,000 \times 13.94 = 53,000,000$ bushels.

Early in December the Railway Department estimated the crop at 52½ million bushels, and the Government Statist at 50½ million bushels.

Summary.

The main interest of the graph lies in the fact that it shows more or less completely—

(1) The quantitative relationship existing between the average wheat yield and the rainfall.

(2) The gradual improvement in our agricultural methods, as illustrated by the increasing amount of wheat produced for each unit of rainfall.

(3) That it is possible to estimate with some degree of approximation the probable crop of Victoria early in November from a knowledge of the rainfall at typical wheat centres.

WHEN resting horses during the spring and summer work always turn their heads towards the breeze. They will cool off much more quickly, and will be more benefited by the short respite. While they are standing hold the collars off their shoulders for a few minutes, and, at the same time, give each shoulder a good rubbing with the hand. This removes sweaty grease and dirt, cools and helps to toughen the shoulders, and is a great aid in the prevention of scalding.

A DULL hoe never kills as many weeds as a sharp one, and is harder to use. Five minutes' work with a file or emery wheel will do wonders towards killing the weeds in the potato or onion crop.

REPORT ON EXPERIMENT IN PICKING, PACKING, HANDLING, COOL-STORAGE, AND TRANSPORTATION OF PEACHES.

By E. Meeking, Senior Inspector of Fruit for Export.

INTRODUCTORY.

During the visit of the State Rivers and Water Supply Commission to the Irrigation Settlements in the northern portions of the State, in January of the present year, the Hon. F. G. Clarke, M.L.C., one of the parliamentary party who accompanied the Commission, drew attention to the extremely large area recently planted, and in course of being planted, with fruit trees of various kinds, consisting mainly of peach and apricot trees. These all showed signs of the most vigorous growth, and gave promise of yielding, in the immediate future, prolific crops of high grade fruits.

Considering the experience of Ardmona, Kyabram, Lancaster, and other old-established fruit-growing centres north of the Dividing Range, where for many years peaches and apricots of quality second to none in the world had been plentifully and profitably raised, it would appear that the outlook for the owners of the new plantations was extremely bright, and that the path to prosperity, or even to affluence, lay right beneath their feet.

The question of the profitable disposal of the prospective crops, however, kept obtruding itself upon the mind of Mr. Clarke, and after careful inquiry into and consideration of the facts, he arrived at the conclusion that when the new areas came into full bearing, not only the new settlers, but the whole of the peach and apricot growers of the State, would be faced with the problem of over-production, and consequently diminished profits, or perhaps actual loss. He reasoned that the flourishing condition of the settlers in the old-established centres afforded no criterion as to the future prospects of the industry, as the limited supply had hitherto fallen short of the demand, thus insuring good average prices, with attendant substantial profits. So far, the local and Inter-State markets had absorbed all that had been produced, and by their easy accessibility had enabled growers to place their fruit on these in good condition, without adopting any means other than those which lay at hand. With the over-supply of these markets which would invariably follow the greatly increased production, the disposal of the surplus crop elsewhere would become imperative, and would necessitate the introduction of special methods whereunder this could be ensured. This could be carried out in the five following ways:—

(*a*) Marketing the fruit in its fresh state by the application of specialized methods in picking, packing, handling, and transportation.
(*b*) Drying.
(*c*) Canning.
(*d*) Pulping.
(*e*) Jam-making.

No adequate provision to meet the prospective situation had been undertaken in any of the directions mentioned, and apparently the growers had not seriously considered the advisability of making a move. Up to the present, many of the Goulburn Valley growers have annually disposed of a proportion of their crop to Melbourne manufacturers for canning, pulping, and jam-making; but the outlet in this direction did not promise to be large enough to avert the threatened catastrophe.

When in London, Mr. Clarke had noticed peaches offered for sale in the markets and large retail shops at almost fabulous prices, and it struck him that if peaches could be landed there in large quantities, and in good condition, not only would the necessary outlet for the surplus be provided, but the growers would, in spite of the increased production, obtain even better returns than formerly.

With the idea of enlisting the assistance of the Department of Agriculture in this direction, he therefore approached the Hon. the Minister of Agriculture, and suggested that, with the aid of departmental officials, a lecturing tour be undertaken through the Goulburn Valley, with the object of inducing the help of growers in carrying out a series of experiments in the cool-storage and transportation of peaches. The Minister and Director readily consented to this, and on the 5th January, 1915, Mr. Clarke, Mr. P. J. Carmody, Chief Orchard Supervisor, and the writer left Melbourne. Ardmona was the first place visited, and after the object of the visit had been explained to a representative meeting of growers, all present expressed their willingness to contribute fruit for the purpose of the experiment. Kyabram and Lancaster were next visited, with similar results; and a visit to the newly-formed settlement of Nanneella, near Rochester, completed the tour. Although the growers at the latter settlement were unable to contribute any fruit, they were fully convinced of the value of the experiment, and were heartily in accord with the object with which it was being carried out. It was arranged at Ardmona, Kyabram, and Lancaster, that the writer should return the following week and supervise the packing and despatch of the fruit to Melbourne. A sheet, on which the following was typed, was supplied to each grower who intended to contribute fruit to the experiment:—1. Name and address of grower; 2. Locality; 3. Variety; 4. If irrigated, date of last irrigation; 5. Rainfall during preceding twelve months; 6. Stage of maturity of fruit; 7. Date and hour when picked; 8. Temperature at time of picking; 9. Kind of package used; 10. Wrapped or unwrapped (if wrapped, state number of wrappers used), XYZ and wood wool; 11. Type of car used (louvre, insulated, or ice car); 12. Temperature of car at time of despatch; 13. Date and time when despatched to Government Cool Stores; 14. Date of arrival at Government Cool Stores; 15. Temperature of car on arrival at Government Cool Stores.

I accordingly revisited Ardmona on the following Monday, 11th January, 1915, accompanied by a departmental fruit-packer, who attended to pack the fruit. The fruit was assembled at the orchard of Mr. A. Lonnie on the Tuesday morning, and, with the assistance of the growers, 20 cases were packed in various types of packages, then conveyed into Shepparton, and at 3 p.m. on the 13th January, 1915, were placed in the chamber of the Shepparton Freezing Works, which

the manager had kindly consented to reserve for this purpose. These were run down to 31 degrees F., and twenty-four hours later were despatched in an ice-car to the Government Cool Stores, Victoria Dock. The trucks had been iced in Melbourne before despatch to Shepparton, but as the bunkers were found to be nearly exhausted on the day when the fruit was loaded, the car was re-iced at Shepparton immediately prior to its departure for Melbourne, and left with the bunkers well filled. The temperature of the car prior to loading was 56 deg. F., and at time of arrived at the Government Cool Stores, Melbourne—fifteen hours later—the temperature was 50 degrees F., showing a fall of 6 deg. F.

Kyabram was visited the following day, and the fruit, which was assembled in the goods-sheds at the local station, was despatched immediately after packing in an ice-car, which was also re-iced prior to departure. In this instance, the fruit was not pre-cooled, as no means were available at Kyabram for this purpose. The temperature of the car immediately prior to loading was 53 degrees F.; and on arrival at the Government Cool Stores twenty hours later, the temperature was 60 degrees F., showing a rise of 7 degrees F. The difference in temperature shown in the two cars at the conclusion of their respective runs was rather interesting, as illustrating the relative value of pre-cooling fruit prior to consignment against forwarding fruit in ice-car without first extracting the heat from the fruit. As no thermographs were installed in the cars, the variations in temperature during transit could not be recorded; but as the ice in the bunkers of the car forwarded from Shepparton showed less than 30 per cent. wastage at the end of the trip, the bunkers of the car despatched from Kyabram were found on arrival at the Government Cool Stores to be more than half empty, representing a loss in ice of over 50 per cent. Clear proof was thus afforded of the assistance which pre-cooling renders in holding the inside temperatures of ice-cars at a low uniform level during runs over long distances. The excessive melting of the ice in the case of the Kyabram car represented the work of extracting the heat from the fruit, and which, in the case of the car from Shepparton, had been effected by the pre-cooling; thus giving the fruit in this car the advantage of reaching a low temperature many hours sooner than was possible in the case of the non-pre-cooled fruit despatched from Kyabram. Had the run been extended over a much longer distance, say, to Sydney, re-icing *en route* of the car from Kyabram would have been necessary to hold the fruit at a low temperature. The low temperature of the car from Shepparton, however, could apparently have been maintained throughout the run without re-icing the car. In future experiments, it is hoped that self-recording thermometers may be installed in cars, when thermograph records may be kept of the fluctuations of temperature in cars in transit.

It was originally intended to record fairly elaborate data in connexion with the experiment, so that the problem of successfully transporting peaches over long distances could be studied from all possible stand-points. Notes were therefore taken of all the circumstances incidental to the experiment which perhaps might directly affect the result of same. It was found, however, that owing to certain difficulties this could not be carried out; so the notes were confined to those headings shown in the list hereunder. No record was kept of the ages of the trees from which the fruit was selected, whether trees had, or had

not, been manured, or of the quantity, nature, and frequency or application of such manure.

The fruit was placed in the Government Cool Stores, Victoria Dock, on the following dates:—Ardmona consignment, 14th January, 8 a.m.; Kyabram consignment, 16th January, 11 a.m. During the period of storage, the fruit was kept at a uniform temperature of 31 degrees F., in a chamber specially constructed for experimental purposes, which was fitted with the direct-expansion system. No tests were made under the air-circulating system, as all the chambers installed with that system were utilized for meat. The consignments were removed from the chamber on Friday, 5th March, 1915—seven weeks from date of storage, a period which would cover the time required to ship fruit to any part of the world. The cases were opened in the butter-grading room adjoining the storage chamber, in the presence of the Hon. the Minister of Agriculture, the Exports Superintendent, and a representative gathering of fruit-growers, merchants, agents, and departmental officials. After the Minister had explained the object of the experiment, the fruit was examined by those present, and found to be remarkably sound and fine in appearance.

As one or two days elapse before fruit sold in the London and European markets can be disposed of by the retailers to the consumers, it was decided to keep the fruit for a corresponding period out of cool storage before examining it in connexion with the judging.

A committee, consisting of Mr. A. V. McNab, Secretary, Ardmona Fruit-growers Association; Mr. F. W. Vear, member of the executive, Central Fruit-growers Association; Mr. S. A. Cock; Orchard Supervisor, Department of Agriculture; and the writer, were accordingly appointed to carry this out; and on the following Monday, 8th March, 1915—three days after the original examination and removal from the cool chamber—the fruit was re-examined. It was decided to judge from the following stand-points:—(*a*) appearance, (*b*) soundness, (*c*) flavour; and the maximum points to be awarded with respect to these were appearance, 75 points; soundness, 75 points; flavour, 100 points—a total maximum of 250 points.

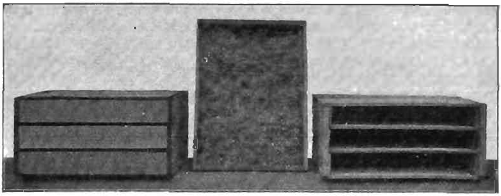
The appended tables show results of analyses of the judging.

Some of the data, which were given on the record sheets supplied to growers, are not shown in the headings to the tables, but are included in the foot-notes. This data, such as rainfall, type of car used, temperature of car at time of despatch, date of despatch, &c., were uniform for each locality and grower, and their inclusion in the tables would have necessitated unnecessary repetition. It was therefore decided to include in the tables variable factors only, such as date and hour of picking, temperature and time of picking, kind of package, and number of wrappers used, to determine the influence which these might have upon the keeping qualities of the fruit.

Nos. 1 and 2 Tables show the general results of the examination; No. 3 Table indicates the influence of the different types of package (see *illustration*); No. 4 Table shows the effect of double wrapping, single wrapping, or absence of wrapping; No. 5 Table shows the points scored by each variety.

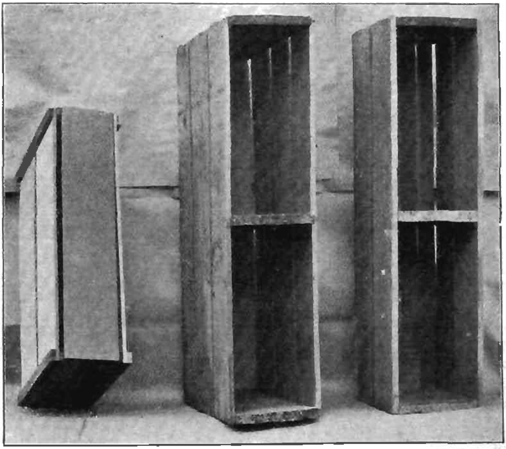
Regarding the above, it would appear that slightly better results were obtained through the use of nests of three trays than from the use

of any other type of package. The same remarks apply to the use of double wrappers as against the use of the single wrapper or the packing of the fruit unwrapped.



No. 1. No. 2. No. 3

No. 1.—Nest of Three Trays, Hoop-ironed.
No. 2.—Single Tray, showing Wood-wool Lining.
No. 3.—Westwood Patent Case, Showing Moveable Partitions.

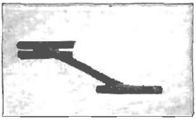


No. 1. No 2. No. 3.

No. 1.—Type of Peach Tray used in America.
No. 2.—Australian "Flat" bushel Case.
No. 3.—Australian "Flat" half-bushel Case.

Results of the analyses of the following factors, viz., date of irrigation, annual rainfall, maturity of fruit, date and hour when picked, temperature at time of picking, atmospheric temperature at time of storage, pre-cooling, or non-pre-cooling, were even smaller than the results obtained in connexion with the types of packages, wrapping, or variety of fruit—in fact, were too small to justify publication.

In addition to the fruit included in the two main experiments, three of the Ardmona growers, viz., Messrs. D. Simpson, V. R. McNab, and H. Pickworth, forwarded a few cases of "Pullar's Cling" and "Nicholl's Orange Cling" varieties. The first lot, two cases of "Nicholl's Orange Cling," consigned by Mr. D. Simpson, were placed in cool storage two or three days after the fruit included in the main Ardmona experiment. These were removed at the same time as the other fruit, and on being tested were found to be in such excellent condition as to appearance, soundness, and flavour that the writer, who made an independent examination, awarded maximum points for appearance, soundness, and flavour. On 26th January, 1915, Mr. V. R. McNab forwarded six cases, consisting of four cases of "Pullar's Cling" and two cases of "Late Red"; and on 24th February, 1915, Mr. H. Pickworth sent two additional cases of "Pullar's Cling." The first of these cases was removed from the cool stores on 3rd March, and thereafter were taken out at weekly intervals, the last being removed on 17th March. The "Pullar's Cling" variety were in such good condition that I awarded them full points on such examination. Samples were retained at my office, and were found to retain their flavour and appearance for eight or ten days. The "Late Red" variety were good in appearance and soundness, but lacking in flavour. The results show that further experiments with the "Pullar Cling" variety are well worth a trial, as it appears to retain its keeping qualities and flavour better than any of the other varieties tested, not even excepting the "Crawford" variety.



Tool used to Hoop-iron Trays.

Summarized, it would seem that, with the exception of the variety of fruit used, none of the factors mentioned seem to have any important bearing on the result. All other varieties, excepting the "Crawford," "Nicholl's Orange Cling" and "Pullar's Cling," show a notable absence of flavour, irrespective of all the conditions under which the fruit was picked and packed.

The "Crawford" variety, especially in connexion with the Kyabram experiment, showed fair results, even after the fruit had been kept for seven or eight days after removal from the store.

The experiments generally show that the two varieties of clingstones, viz., "Pullar's Cling" and "Nicholl's Orange Cling," were far and away the best peaches of the tests for retaining their keeping qualities in cool storage; and, although the experiments might be continued in connexion with the "Crawford" variety, it would appear that the two clingstone varieties are the ones from which the best results may be hoped.

The results obtained in connexion with "Elberta" variety were in particular very disappointing, as the "Elberta" is one of the most

[Continued on page 54.]

TABLE No. 1.—GENERAL ANALYSIS OF RESULTS OF JUDGING (ARDMONA).

Variety.	Grower.	Date of Last Irrigation.	Stage of Maturity of Fruit.	Date and Hour when Picked.	Temperature at Hour of Picking.	Description of Package.	Wrapped or Unwrapped.	Results of Examination. Points scored. (Total Possible Maximum, 250.) Appearance (Max. 75.)	Soundness (Max. 75).	Flavour (Max. 100).	Total.	Percentages of Points scored in Relation to Possible Maximum. Appearance.	Soundness.	Flavour.	Total.
					Fahr.							%	%	%	%
wford.. ..	H. Pickworth and Son..	25.12.14	B	4 p.m., 11.1.15 ..	80 deg. ..	Nest three trays	X	65	65	..	130	26	26	..	52
							X	65	65	..	130	26	26	..	52
							X	65	65	..	130	26	26	..	52
" ..	G. Wilson	8.1.15	B (1)	10 a.m., 12.1.15..	72 deg. ..	1-bushel cases..	X	65	65	30	160	26	26	12	64
							Z	65	65	30	160	26	26	12	64
" ..	P. Pullar and Nephew..	3.1.15	C	7.30 a.m., 12.1.15	60 deg. ..	1-bushel cases..	X	60	60	..	120	24	24	..	48
							Z	55	55	..	110	22	22	..	44
erta ..	A. Lennie	1.1.15	B (1)	5 p.m., 11.1.15 ..	80 deg. ..	Nest three trays	X	70	70	..	140	28	28	..	56
							Y	70	70	..	140	28	28	..	56
							Z	70	70	..	140	28	28	..	56
" ..	H. Pickworth and Son..	9.1.15	B	7.30 a.m. 12.1.15	60 deg. ..	Nest three trays	X	55	55	..	110	22	22	..	44
							X	55	55	..	110	22	22	..	44
							X	55	55	..	110	22	22	..	44
" ..	E. Bissick	No record	B	4 p.m., 11.1.15 ..	85 deg. ..	½-bushel cases..	X	65	65	..	130	26	26	..	52
							Z	65	65	..	130	26	26	..	52
" ..	E. Bissick	"	B	8.50 a.m., 11.1.15	80 deg. ..	½-bushel cases	X	65	65	..	130	26	26	..	52
							Z	60	60	..	120	24	24	..	48
" ..	Young Bros.	"	L	11.1.15 ..	80 deg. ..	1-bushel cases	Z	45	45	..	90	18	18	..	36
							Z	45	45	..	90	18	18	..	36
" ..	Young Bros.	"	B (1)	8 a.m., 12.1.15 ..	60 deg. ..	Nest three trays	X	60	60	..	120	24	24	..	48
							Y	60	60	..	120	24	24	..	48
							Z	60	60	..	120	24	24	..	48
Eagle ..	F. Woods	No record	C	7.30 a.m., 12.1.15	60 deg. ..	Nest three trays	X	65	65	..	130	26	26	..	52
							Y	55	55	..	110	22	22	..	44
							Z	50	50	..	100	20	20	..	40
ine de Verge	Turnbull Bros. ..	28.12.15	C (1)	7.30 a.m., 12.1.15	60 deg ..	Nest three trays	X	75	75	..	150	30	30	..	60
							Y	75	75	..	150	30	30	..	60
							Z	75	75	..	150	30	30	..	60

TABLE No. 1.—GENERAL ANALYSIS OF RESULTS OF JUDGING (ARDMONA)—*continued.*

Variety.	Grower.	Date of Last Irrigation.	Stage of Maturity of Fruit.	Date and Hour when Picked.	Temperature at Hour of Picking.	Description of Package.	Wrapped or Unwrapped.	Results of Examination. Points scored. (Total Possible Maximum, 250.) Appearance (Max. 70.)	Soundness (Max. 75).	Flavour (Max. 100).	Total.	Percentages of Points scored in Relation to Possible Maximum. Appearance.	Soundness.	Flavour.	Total percentage.
					Fahr.							%	%	%	%
Muir ..	D. Simpson and Sons ..	7.1.15	C	7.30 a.m., 12.1.15	60 deg. ..	Nest three trays	X	55	65	..	120	22	26	..	48
							Y	65	65	..	130	26	26	..	52
							Z	65	65	..	130	26	26	..	52
"	D. Simpson and Sons ..	7.1.15	C	7.30 a.m., 12.1.15	60 deg. ..	Bushel cases	X	65	65	..	130	26	26	..	52
							Z	65	65	..	130	26	26	..	52
"	P. Pullar and Nephew ..	3.1.15	C	5 p.m., 11.1.15 ..	60 deg. ..	Nest three trays	X	60	60	..	120	24	24	..	48
							Y	60	60	..	120	24	24	..	48
							Z	55	55	..	110	22	22	..	44
Kia Ora ..	C. Hornidge	1.1.15	C	7.30 a.m., 12.1.15	60 deg. ..	Westwood's patent cases, three partitions	X	65	65	..	130	26	26	..	52
							X	65	65	..	130	26	26	..	52
							X	65	65	..	130	26	26	..	52
" ..	C. Hornidge	1.1.15	C	7.30 a.m., 12.1.15	60 deg. ..	½-bushel cases	Z	55	55	..	110	22	22	..	44
							Z	55	55	..	110	22	22	..	44
" ..	H. V. McNab.. ..	24.12.14	C	7 a.m., 12.1.15 ..	60 deg. ..	Westwood's patent cases	X	65	65	..	130	26	26	..	52
							Y	65	65	..	130	26	26	..	52
							Z	65	65	..	130	26	26	..	52
" ..	A. Henderson ..	10.1.15	C	12 noon, 12.1.15	75 deg. ..	Westwood's patent cases	X	65	65	..	130	26	26	..	52
							X	65	65	..	130	26	26	..	52
							Y	65	65	..	130	26	26	..	52
Late Red (uncertain)	A. S. Henderson ..	8.1.15	C	Noon, 12.1.15 ..	75 deg. ..	Nest three trays	X	65	65	..	130	26	26	..	52
							Y	65	65	..	130	26	26	..	52
							Z	55	55	..	110	22	22	..	44
Late Red ..	A. Henderson ..	10.1.15	C	11 a.m., 12.1.15..	75 deg. ..	½-bushel cases	X	45	45	..	90	18	18	..	36
							Z	45	45	..	90	18	18	..	36

NOTE 1.—B (1) Means fruit which is full-grown and fully coloured, but firm.
B. Means fruit which is full-grown and fully coloured, but hard.
C (1) Means fruit which is full-grown, not quite fully coloured, and hard.
C. Means fruit which is not quite full-grown, nor fully coloured, and very hard.

NOTE 2.—*Rainfall during preceding twelve months*, 9¼ *inches*. *Date of storage country cool store*, 5 *p.m.*, 12.1.15. *Atmospheric temperature* time of storage, 75 deg. Fahr. Temperature of chamber, 30 deg. = 32 deg. Fahr. Date of despatch, 4.30 p.m., 13.1.15. Temperature of car at time of despatch, 56 deg. Fahr. Date of arrival at Government Cool Stores, 8 a.m., 14.1.15. Temperature of car on arrival at Government Cool Stores, 50 deg. Fahr.

NOTE 3.—X means wrapped in one paper, Y wrapped in two papers, Z unwrapped.

TABLE II.—GENERAL ANALYSIS OF RESULTS OF JUDGING (KYABRAM AND LANCASTER).

Variety.	Grower.	Date of Last Irrigation.	Stage of Maturity of Fruit.	Date and Hour when Picked.	Temperature at *Hour of* Picking.	Description of Package.	Wrapped or Unwrapped.	Points scored. (Total Possible Maximum, 250.) Appearance (Max. 75.)	Soundness (Max. 75).	Flavour (Max. 100).	Total.	Percentages of Points scored in Relation to Possible Maximum. Appearance. (Max. 75).	Soundness (Max. 75).	Flavour (Max. 100).	Total.
					Fahr.							%	%	%	%
Late Red ..	E. J. Dowling ..	2.1.15	C	9 a.m., 14.1.15 ..	70 deg. ..	Nest of three trays	X	65	70	..	135	26	28	..	54
							Y	60	70	..	130	24	28	..	52
							Z	70	65	..	135	28	26	..	54
" ..	Tuckfield Bros. ..	1.1.15	C	4 p.m., 13.1.15 ..	80 deg. ..	Nest of three trays	X	65	60	..	125	26	24	..	50
							Y	60	55	..	115	24	22	..	46
							Z	70	65	..	135	28	26	..	54
" ..	W. Liston	20.12.14	C	7 p.m., 13.1.15 ..	70 deg. ..	Nest of three trays	X	65	65	..	130	26	26	..	52
							Y	65	65	..	130	26	26	..	52
							Z	65	65	..	130	26	26	..	52
" ..	J. West	1.1.15	C	8 a.m., 14.1.15 ..	70 deg. ..	Westwood's patent case	X	65	65	..	130	26	26	..	52
							Y	70	70	..	140	28	28	..	56
							Z	70	70	..	140	28	28	..	56
" ..	J. West	1.1.15	C	8 a.m., 14.1.15 ..	70 deg. ..	American tray	Z	70	70	..	140	28	28	..	56
" ..	L. G. Clarke	11.1.15	C	6.30 a.m., 14.1.15	65 deg. ..	Bushel case ..	Y	60	70	..	130	24	28	..	52
							Z	60	70	..	130	24	28	..	52
Elberta ..	L. G. Clarke	11.1.15	C	6.30 a.m., 14.1.15	65 deg. ..	½ bushel ..	X	55	65	..	120	22	26	..	48
							Y	55	70	..	125	22	28	..	50
" ..	J. Anthony	7.1.15	C.	8 a.m., 14.1.15 ..	*No record* (presumably 70 deg.)	Westwood's patent case	X	60	60	..	120	24	24	..	48
							Y	60	70	..	130	24	28	..	52
							Z	50	50	..	100	20	20	..	40
" ..	A. G. Marchant ..	31.12.14	C	8 a.m., 14.1.15 ..	76 deg. ..	Bushel case ..	X	65	65	..	130	26	26	..	52
							Z	65	65	..	130	26	26	..	52
" ..	J. Anthony	7.1.15	C	8 a.m., 14.1.15 ..	No record (presumably *70 deg.)*	Nest of three trays	X	65	65	..	130	26	26	..	52
							Y	65	70	..	135	26	28	..	54
							Z	60	60	..	120	24	24	..	48
" ..	A. Eastwood	26.12.14	C	9 a.m., 13.1.15 ..	118 deg. (sun)	Westwood's patent case	X	50	60	..	110	20	24	..	44
							Y	50	50	..	100	20	20	..	40
							Z	60	60	..	120	24	24	..	48
" ..	F. C. King	No record	C	13.1.15 ..	No record	Bushel case ..	Z	55	65	..	120	22	26	..	48
							Z	55	65	..	120	22	26	..	48

TABLE II.—GENERAL ANALYSIS OF RESULTS OF JUDGING (KYABRAM AND LANCASTER)—*continued.*

Variety.	Grower.	Date of Last Irrigation.	Stage of Maturity of Fruit.	Date and Hour when Picked.	Temperature at Hour of Picking.	Description of Package.	Wrapped or Unwrapped.	Results of Examination. Points scored. (Total Possible Maximum, 250.) Appearance (Max. 75.)	Soundness (Max. 75).	Flavour (Max. 100).	Total.	Percentages of Points scored in Relation to Possible Maximum. Appearance (Max. 75).	Soundness (Max. 75).	Flavour (Max. 100).	Total.
					Fahr.							%	%	%	%
Elberta ..	J. B. Sawyers ..	5.1.15	C	8.30 a.m., 13.1.15	75 deg. ..	Bushel case ..	X	60	70	..	130	24	28	..	52
							Y	60	70	..	130	24	28	..	52
" ..	J. H. Lancaster ..	11.1.15	B	9 a.m., 14.1.15 ..	80 deg. ..	Nest of three trays	X	40	60	..	100	16	24	..	40
							Y	45	60	..	105	18	24	..	42
							Z	35	55	..	90	14	22	..	32
Muir ..	G. D. Steele ..	6.1.15	B	10 a.m., 13.1.15 ..	No record (presumably 85 deg.)	Bushel case ..	X	65	65	..	130	26	26	..	52
							Z	50	50	..	100	20	20	..	40
" ..	J. West ..	11.1.15	C	8 a.m., 14.1.15 ..	70 deg. ..	Bushel case ..	X	56	60	..	115	22	24	..	46
							Z	55	70	..	125	22	28	..	50
Crawford ..	S. Young ..	9.1.15	C	7 a.m., 14.1.15 ..	70 deg. ..	Nest of three trays	X	70	70	80	220	28	28	32	88
							Y	70	70	80	220	28	28	32	88
							Z	60	60	80	200	24	24	32	80
" ..	S. Young ..	9.1.15	C	7 a.m., 14.1.15 ..	70 deg. ..	½-bushel cases	X	65	70	40	175	26	28	16	70
							Z	65	65	40	170	26	26	16	68
" ..	J. West ..	1.1.15	B (1)	8 a.m., 14.1.15 ..	70 deg. ..	Nest of three	X	65	70	40	175	26	28	16	70
							Y	65	60	40	165	26	24	16	66
							Z	70	70	40	180	28	28	16	72
" ..	J. West ..	1.1.15	B (1)	8 a.m., 14.1.15 ..	70 deg. ..	½-bushel cases	X	70	70	30	170	28	28	12	68
							Z	70	70	30	170	28	28	12	68
Late Crawford	Tuckfield Bros. ..	1.1.15	B	4 p.m., 13.1.15 ..	80 deg. ..	Nest of three trays	X	60	65	45	170	24	26	18	68
							Y	70	65	45	180	28	26	18	72
							Z	60	55	45	160	24	22	18	64
Early Crawford	F. Cooper ..	7.1.15	B (1)	8 a.m., 14.1.15 ..	70 deg. ..	Nest of three trays	X	55	65	70	190	22	26	28	76
							Y	60	70	70	200	24	28	28	80
							Z	60	70	70	200	24	28	28	80

NOTE 1.—B (1) Means fruit which is full-grown, and fully coloured, but firm.
B Means fruit which is full-grown, and fully coloured, but hard.
C (1) Means fruit which is full-grown, not quite fully coloured, and hard.
C Means fruit which is not quite full-grown, nor fully coloured, and very hard.

NOTE 2.—Rainfall during preceding twelve months, 9¼ inches. Temperature of car at time of despatch, 53 deg. Fahr. Date and time of despatch, 4.20 p.m., 14.1.15. Date of arrival at Government Cool Stores, 2 p.m., 15.1.15. Temperature of car on arrival at Government Cool Stores, 60 deg. Fahr.

NOTE 3.—X means wrapped in one paper, Y wrapped in two papers, Z unwrapped.

TABLE III.—RELATIVE VALUE OF VARIOUS KINDS OF PACKAGES IN RELATION TO STORAGE AND TRANSPORTATION OF PEACHES.

Kind of Package.	Ardmona.					Kyabram and Lancaster.					
		Average of Points scored.					Average of Points scored.				
	No. of Tests.	Appearance. (Possible Maximum, 75 Points).	Soundness. (Possible Maximum, 75 Points).	Flavour. (Possible Maximum, 75 Points).	Total. (Possible Maximum, 250 Points).	No. of Tests.	Appearance. (Possible Maximum, 75 Points).	Soundness. (Possible Maximum, 75 Points).	Flavour. (Possible Maximum, 75 Points).	Total. (Possible Maximum, 250 Points).	Grand Average Totals.
Nests of three trays ..	27	62·59	62·96	2·22	127·40	27	61·48	64·29	31·29	157·06	142·23
Westwood's patent case ..	9	65·00	65·00	..	130 00	9	59·44	61·66	..	121·10	125·55
One-bushel case.. ..	8	58·12	58·12	7·50	123·74	10	58·50	64·50	..	123·00	123·37
Half-bushel case ..	8	56·87	56·87	..	113·74	6	63·33	67·50	23·33	154·16	133·95

TABLE IV.—ANALYSIS SHOWING EFFECT OF DOUBLE WRAPPING, SINGLE WRAPPING, AND UNWRAPPING FRUIT.

ARDMONA.

Variety.	X.					Y.					Z.				
		Average of Points scored.					Average of Points scored.					Average of Points scored.			
	No. of Tests.	Appearance.	Soundness.	Flavor.	Total.	No. of Tests.	Appearance.	Soundness.	Flavor.	Total.	No. of Tests.	Appearance.	Soundness.	Flavor.	Total.
Elberta ..	7	60·71	60·71	..	121·42	3	63·33	63·33	..	126·66	5	57·00	57·00	..	114·00
Sea Eagle ..	1	65·00	65·00	..	130·00	1	55·00	55·00	..	110·00	1	50·00	50·00	..	100·00
Reine de Verge	1	75·00	75·00	..	150 00	1	75 00	75·00	..	150·00	1	75·00	75·00	..	150·00
Muir	3	60·00	63·33	..	123·33	2	62·50	65·00	..	127·50	3	61·66	61·66	..	123·32
Kia Ora ..	6	65·00	65·00	..	130·00	2	65 00	65·00	..	130·00	3	58·33	58·33	..	116·66
Late Red ..	2	55·00	55·00	..	110·00	1	65 00	65·00	..	130·00	1	33·33	33·33	..	60·66
Crawford ..	5	64·00	64·00	6·00	134·00	..	..	..	..	..	2	60·00	60·00	15·00	135·00

KYABRAM AND LANCASTER.

Variety.	No. of Tests.	Appearance.	Soundness.	Flavor.	Total.	No. of Tests.	Appearance.	Soundness.	Flavor.	Total.	No. of Tests.	Appearance.	Soundness.	Flavor.	Total.
Elberta ..	9	61·66	63·88	..	125 54	9	60·55	65·55	..	126·10	12	62·50	64·16	..	126·66
Muir	4	55·0	63·75	..	118·75	2	52 5	65·0	..	117·5	3	46·66	58·33	..	104·99
Crawford ..	6	64·16	68·33	50·83	183·32	4	66·25	66·25	58·75	191·25	6	64·16	65·0	50·83	179·99

NOTE.—X means wrapped in one paper. Y means wrapped in two papers. Z means unwrapped.

TABLE V.—COMPARISON OF RESULTS FOR EACH VARIETY OF PEACH.

Variety.	Ardmona.					Kyabram and Lancaster.					Average Points Scored, Ardmona and Kyabram and Lancaster.
		Average Points Scored.					Average Points Scored.				
	No. of Tests.	Appearance. (Maximum, 75 Points).	Soundness. (Maximum, 75 Points).	Flavour. (Maximum, 100 Points).	Total. (Maximum, 250 Points).	No. of Tests.	Appearance. (Maximum, 75 Points).	Soundness. (Maximum, 75 Points).	Flavour. (Maximum, 100 Points).	Total. (Maximum, 250 Points).	
Elberta	15	60·00	60·00	..	120·00	30	61·66	61·66	..	123·32	121 66
Sea Eagle	3	56·66	56·66	..	113·32	..	..	..	..	..	113·32
Reine de Verge	3	75·00	75·00	..	150·00	..	..	..	..	..	150 00
Muir	8	61·25	62·50	..	123·75	9	51·66	62·22	..	113·88	118·81
Kia Ora	11	63·18	63·18	..	126·36	..	..	..	..	..	126·36
Late Red	5	55·00	55·00	..	110·00	..	..	..	..	..	110·00
Crawford	7	62·85	62·85	8·57	134·27	16	64·68	66·56	52·81	184·05	159·16

extensively planted varieties in the Goulburn Valley. It, however, showed an almost total absence of flavour. In future experiments, it would be advisable to experiment with fruit more matured than the fruit which was used in these tests. This should be tried in connexion with all varieties. If the flavour were allowed to fully develop, it is possible that this would be retained until removal of the fruit from cool store.

It must not be forgotten, however, that these experiments are only in their infancy, and that they may perhaps require to be conducted over a considerable period before any definite results can be arrived at.

Addenda.

In addition to the above-mentioned experiments, a series of tests, by direction of Mr. P. J. Carmody, Chief Orchard Supervisor, was conducted at Doncaster under supervision of Mr. A. A. Hammond, Orchard Supervisor for the Doncaster district. The fruit was carefully picked and packed, and was stored at the Government Cool Stores, Doncaster, at a temperature of 32 degrees Fahrenheit. Mr. Hammond has forwarded the following analyses of results:—

Variety.	Number of Fruits.	Date of Storage.	Date of Removal.	Results.
Catherine Ann ..	12	29.1.15	22.3.15	3 peaches sound; 9 peaches unsound; all lacking flavour
Late Crawford ..	5	29.1.15	23.3.15	All slightly gone in centre.
Early Late Crawford	5	29.1.15	22.3.15	All unsound.
Nellie	10	,,	,,	All gone round stone
Elberta	5	,,	,,	,, ,, ,,
Belot's Late ..	5	16.1.15	,,	All unsound.
Petty's Seedling ..	6	,,	,,	Mealy and unsound.
Royal George ..	6	,,	,,	All gone.
Crimson George ..	5	,,	,,	,, ,,
Burger's Seedling ..	6	,,	,,	,, ,,

Mr. Hammond further states:—"The above fruit was kindly presented by Mr. Hudson, of Doncaster. Some of each variety was naked, single wrapped, and double wrapped. The result in all instances was practically the same, viz., the exterior appearance of fruit was good, but, on being cut, all were found to be more or less decayed, and quite lacking flavour. It is worthy of note that some plums of the 'Pickering' variety were similarly experimented with, and came out in excellent condition."

Conclusion.

The tests so far show that, with the exception of the "Crawford" variety, little is to be hoped for in the way of successfully shipping any of the "Slipstone" peaches over long distances; but that the keeping qualities of the "Clingstone" varieties have been established. This is especially the case with the "Nicholl's Orange Cling." Many of the "Freestone" varieties, such as "Elberta," "Muir," &c., which have failed to retain their keeping qualities over the long periods covered in these

experiments should, notwithstanding, be tested for the Inter-State and New Zealand markets. Small consignments should be carefully picked, graded, and packed, pre-cooled, and shipped to New South Wales, Queensland, and New Zealand, in refrigerator accommodation. For such tests the fruit should be well on the ripe side, picked in the evening, cooled under an open shed over night, packed in the early morning, and placed in cool store immediately after packing. Ice car, or insulated car service, should be used to convey the fruit to Melbourne, and, on arrival, it should be placed in the cool chamber on board ship with the least possible delay. The charges involved in this method of transmission preclude the possibility of making a profit in connexion with small experimental shipments; but if the results justify, consignments on a commercial scale could be undertaken later on. If the third rail tests now being conducted on the Murray prove efficient to overcome the lamentable existing break of gauge on our Inter-State railways, the fruit could be forwarded by rail direct to markets in the other States when the third rail system becomes established. In future experiments the question of development of flavour and the period over which this flavour is retained should be carefully noted for each variety tested.

In conclusion, the writer wishes to thank all who have so materially and enthusiastically assisted in carrying out the experiments, and to express his confidence that their enthusiasm remains undiminished, despite the apparent failure of some of our most favoured varieties of peach to withstand the tests to which they were subjected.

VERNACULAR NAMES OF VICTORIAN PLANTS.

Communicated by Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Chairman, and C. S. Sutton, M.B., Ch.B., Secretary of the Plant Names Committee of the Victrrian Field Naturalists' Club.

Continued from page 493, Vol. XIII. (10th August, 1915).

Botanical Name.	Popular Name.	Use or Character.
	SYMPETALEÆ PERIGYNÆ.	
OLACACEÆ.		
Olax—		
stricta, R.Br.	Olax	Of no known economic value.
SANTALACEÆ.		
Exocarpos—		
cupressiformis, Labill. ..	Cherry Ballart	Wood handsome and close grained. Used for turning and cabinet work.

Vernacular Names of Victorian Plants—*continued*.

Botanical Name.	Popular Name.	Use or Character.
	Sympetaleæ Perigynæ—*continued*.	
Santalaceæ—*continued*.		
Exocarpos—continued.		
spartea, R.Br.	Broom Ballart	Of no known economic value.
aphylla, R.Br.	Leafless Ballart	
stricta, R.Br.	Palefruited Ballart	
nana, Hook. f.	Alpine Ballart	
Omphacomeria— acerba, A.DC.	Leafless Sour bush	Of no known economic value.
Leptomeria— acida, R.Br.	Sour Currant-bush	The berries are edible, having a pleasant subacid flavour.
aphylla, R.Br.	Leafless Currant-bush	
Choretrum— glomeratum, R.Br.	Common Currant-bush	Of no known economic value.
spicatum, F.v.M.	Spiked Currant-bush	
lateriflorum, R.Br.	Dwarf Currant-bush	
Santalum— obtusifolium, R. Br.	Blunt-leaved Quandong	Timber is useful for cabinet work.
Fusanus— acuminatus, R.Br.	Sweet Quandong	The timber takes a fine polish and is excellent for cabinet work. The fruit of the Sweet Quandong is edible, and makes an excellent preserve.
persicarius, F.v.M.	Bitter Quandong	
Thesium— australe, R.Br.	Austral Thesium	Of no known economic value.
Loranthaceæ.		
Notothixos— incanus, Oliver	Yellow Mistletoe	Serious pests in forests. All are parasitic on the branches of trees, spreading rapidly over the trees and eventually destroying them.
Loranthus— celastroides, Sieber	Common Mistletoe	
Exocarpi, Behr.	Harlequin Mistletoe	
linophyllus, Fenzl.	Slender Mistletoe	
pendulus, Sieber	Hanging Mistletoe	
Quandang, Lindl.	Grey Mistletoe	
Proteaceæ.	.. ..	In the larger members of this group the timber is beautifully or unusually figured, and hence useful for cabinet work.
Isopogon— anemonifolius, R.Br.	Tall Conebush	Of no known economic value.
ceratophyllus, R.Br.	Horny Conebush	
Adenanthos— terminalis, R.Br.	Hairbush	
Conospermum— Mitchellii, Meiss.	Mountain Conosperm	Worthy of garden culture, especially the first named
patens, Schlech.	Slender Conosperm	
taxifolium, Smith	Yew-leaved Conosperm	
Persoonia— arborea, F.v.M.	Tree Geebung	Wood tough and useful for fishing-rods.
salicina, Persoon.	Willow Geebung	Worthy of cultivation.
lanceolata, Andrews	Bonewood Geebung	Wood useful for tool handles.
confertiflora, Benth.	Closeflowered Geebung	Might possibly be improved by cultivation.
linearis, Andrews	Narrow-leaved Geebung	
revoluta, Sieber	Pale Geebung	
rigida, R.Br.	Hairy Geebung	All more or less worthy of cultivation. P. rigida has edible berries.
myrtilloides, Sieber	Myrtle Geebung	
oxycoccoides, Sieber	Heathy Geebung	
Chamaepeuce, Lhotsky	Dwarf Geebung	
juniperina, Labill.	Prickly Geebung	
Orites— lancifolia, F.v.M.	Alpine Orites	Might be worthy of garden culture.

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	SYMPETALEÆ PERIGYNÆ—*continued.*	
PROTEACEÆ—*continued.*		
Grevillea—		
pterosperma, F.v.M.	Desert Grevillea	
Barklyana, F.v.M.	Large-leaved Grevillea	Useful flowering shrubs or trees, of which G.-alpina G.-floribunda G.-Huegelii, G.-lavandulacea, G.-oleoides, G.-rosmarinifolia, and G.-Victoriae, are especially worthy of cultivation.
repens, F.v.M.	Spreading Grevillea	
Aquifolium, Lindl.	Prickly Grevillea	
ilicifolia, R.Br.	Holly Grevillea	
floribunda, R.Br.	Golden Grevillea	
alpina, Lindl.	Mountain Grevillea	
Williamsoni, F.v.M.	Sierra Grevillea	
lanigera, Cunn.	Woolly Grevillea	
rosmarinifolia, Cunn.	Rosemary Grevillea	
lavandulacea, Schlech	Lavender Grevillea	
Huegelii, Meiss.	Comb Grevillea	
Miqueliana, F.v.M.	Oval-leaved Grevillea	
Victoriae, F.v.M.	Royal Grevillea	
oleoides, Sieber	Olive Grevillea	
confertifolia, F.v.M.	Dense-leaved Grevillea	
parviflora, R.Br.	Small-flowered Grevillea	
australis, R.Br.	Alpine Grevillea	
triternata, R.Br.	Needle Grevillea	
ramosissima, Meiss.	Branched Grevillea	
Hakea—		
eriantha, R.Br.	Tree Hakea	All are worthy of cultivation in gardens and parks.
pugioniformis, Cav.	Dagger Hakea	
vittata, R.Br.	Striped Hakea	
rostrata, F.v.M.	Beaked Hakea	
rugosa, R.Br.	Wrinkled Hakea	
saligna, R.Br.	Willow Hakea	
nodosa, R.Br.	Yellow Hakea	
acicularis, R.Br.	Silky Hakea	Useful as a hedge plant.
leucoptera, R.Br.	Needle Hakea	Timber is coarse-grained and soft. Sometimes used for tobacco-pipes, veneers, &c.
microcarpa, R.Br.	Small-fruited Hakea	Worthy of cultivation.
dactyloides, Cav.	Finger Hakea	Timber hard, close-grained, and useful for cabinet work, but is usually only a shrub.
ulicina, R.Br.	Furze Hakea	Worthy of cultivation.
flexilis, F.v.M.	Flexile Hakea	
Lomatia—		
ilicifolia, R.Br.	Holly Lomatia	Worthy of garden culture.
Fraseri, R.Br.	Tree Lomatia	Handsome timber useful for cabinet work.
longifolia, R.Br.	Long-leaved Lomatia	Worthy of garden culture.
Telopea—		
oreades, F.v.M.	Victorian Waratah	Furnishes an ornamental wood, and is also worthy of garden culture.
Banksia—		
collina, R.Br.	Hill Banksia	Worthy of garden culture.
marginata, Cav.	Silver Banksia	This wood is porous, soft, spongy, and light, but when thoroughly seasoned it is used for indoor ornamental work.
integrifolia, L.	Coast Banksia	Timber takes a good polish, is beautifully grained and suitable for fancy work.
serrata, L.	Saw Banksia	Yields a purplish mahogany-coloured wood useful for making furniture.
ornata, F.v.M.	Desert Banksia	Worthy of garden culture.
RUBIACEÆ.		
Morinda—		
jasminoides, Cunn.	Jasmin Morinda	Wood yellow and prettily marked, but usually only a shrub.
Nertera—		
depressa, Banks	Cushion Nertera	Useful for cultivation as a pot plant.
reptans, F.v.M.	Dwarf Nertera	Of no known economic value.
Coprosma—		
repens, Hook. f.	Spreading Coprosma	The fruits are edible, but are too small to be of much value, and C. Billardieri makes a good hedge plant.
nitida, Hook. f.	Shining Coprosma	
Billardieri, Hook. f.	Prickly Coprosma	
hirtella, Labill.	Rough Coprosma	

Vernacular Names of Victorian Plants—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	Sympetaleæ Perigynæ—*continued.*	
Rubiaceæ—*continued.*		
Opercularia—		
scabrida, Schlech. ..	Rough Stinkweed ..	Of no known economic value.
aspera, Gaertn.	Thin Stinkweed ..	
hispida, Spreng	Hairy Stinkweed ..	
ovata, Hook. f.	Broad Stinkweed ..	
varia, Hook. f.	Variable Stinkweed ..	
Pomax—		
umbellata, Soland. ..	Pomax	Might be worthy of garden culture.
Asperula—		
Gunnii, Hook. f. ..	Mountain Woodruff ..	Plants of slight pasture value.
scoparia, Hook. f. ..	Common Woodruff ..	
Galium—		
parisiense, L. var. australe, Ewart	Wall Bedstraw	
umbrosum, Soland. ..	Mouri Bedstraw.. ..	
Gaudichaudi, D.C. ..	Rough Bedstraw ..	
australe, D.C.	Tangled Bedstraw ..	
geminifolium, F.v.M. ..	Twin-leaved Bedstraw ..	
Caprifoliaceæ.		
Sambucus—		
xanthocarpa, F.v.M. ..	Yellow Elderberry ..	Worthy of garden culture. *The fruits* are sweetish.
Gaudichaudiana, D.C. ..	White Elderberry ..	
Passifloraceæ.		
Passiflora—		
cinnabarina, Lindl. ..	Red Passionflower ..	A good climber. Worthy of garden cultivation.
Cucurbitaceæ.		
Melothria—		
Muelleri, Benth. ..	Mallee Cucumber ..	Of no known economic value
Sicyos—		
angulata, L.	Star Cucumber	Of no known economic value.

(To be continued.)

A collar to fit properly should come close to the sides of the neck, with just room to shove your fingers in between the neck and collar at the bottom. For a horse that has a very thick neck, and gets sore at the top of the shoulders, take a collar, and, after oiling it well to make the leather pliable, fit it on a block of wood that will spread it in the right shape, buckle up tight, and leave for a couple of days, when it will keep that shape.

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commenced 15th April, 1915; concluding 14th April, 1916.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.11.15	15.11.15 to 14.12.15	Eight months.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
38	White Leghorns ..	G. McDonnell	969	147	1,116	1
2	" ..	E. A. Lawson	952	157	1,109	2
84	" ..	H. McKenzie and Son ..	951	153	1,104	3
42	" ..	W. M. Bayles	930	151	1,081	4
19	" ..	*L. G. Broadbent* ..	*938*	*136*	*1,074*	*5*
8	" ..	C. J. Jackson	916	143	1,059	6
21	" ..	E. B. Harris	939	109	1,048	7
5	" ..	J. J. West	916	119	1,035	8
7	" ..	Marville Poultry Farm ..	891	140	1,031	9
9	" ..	J. Schwabb	884	121	1,005	10
30	" ..	A. E. Silberelsen ..	855	148	1,003	11
69	" (5 birds)	W. G. Swift	922	75	997	12
23	" ..	Fulham Park	833	154	987	13
6	" ..	*F. Doldissen*	*880*	*106*	*986*	*14*
59	" ..	W. G. Osburne	829	156	985	15
26	" ..	A. Mowatt	864	118	982	} 16
89	" ..	*W. M. Sewell*	*856*	*126*	982	
28	" ..	R. Lethbridge	828	153	981	} 18
3	" ..	J. H. Gill	834	147	981	
16	" ..	*N. Burston*	848	129	977	} 20
4	" ..	R. Hay	844	133	977	
60	" ..	John Hood	825	144	969	22
44	" ..	Mrs. F. M. Oliver ..	835	133	968	} 23
54	" ..	W. G. Clingin	823	145	968	
11	" ..	J. B. Brigden	830	137	967	} 25
13	" ..	T. Hustler	820	147	967	
10	" ..	A. E. Tuttleby	860	106	966	27
1	" ..	Mrs. H. Stevenson ..	828	125	953	28
18	" ..	D. Adams	815	136	951	29
82	" ..	F. Hodges	827	116	943	30
49	" *(5 birds)*	*Bennett and Chapman* ..	816	126	942	31
24	" ..	Lysbeth Poultry Farm ..	810	130	940	32
25	" (5 birds)	Giddy and Son	800	126	926	33
20	" ..	R. W. Pope	772	145	917	34
80	" ..	H. C. Brock	796	111	907	} 35
27	" ..	J. A. Stahl	760	147	907	
83	" (5 birds)	A. W. Hall	779	127	906	37
15	" ..	H. N. H. Mirams ..	779	121	900	} 38
43	" ..	H. I. Morrick	756	144	900	
68	" ..	Thirkell and Smith ..	742	154	896	40
65	" ..	W. N. O'Mullane ..	775	113	888	41
48	" ..	C. J. Beatty	761	126	887	42
36	" ..	Weldon Poultry Yards ..	729	152	881	43
47	" ..	J. C. Armstrong ..	756	121	877	44
22	" ..	S. Buscumb	729	139	868	45
12	" ..	G. Hayman	732	124	856	46
41	" ..	J. A. Donaldson ..	721	129	850	47
46	" ..	R. Berry	711	117	828	48
52	" ..	A. A. Sandland	708	117	825	49
45	" ..	South Yan Yean Poultry Farm	713	110	823	50
40	" ..	C. C. Dunn	691	126	817	51
57	" ..	B. Mitchell	707	97	804	52
87	" ..	A. Ross	653	123	776	53
14	" ..	W. Flood	632	124	756	54
81	" ..	L. McLean	584	134	718	55
56	" *(5 birds)*	*C. Hurst*	593	101	694	56
		Total	45,147	7,294	52,441	

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915–16—*continued.*

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.11.15	Totals. 15.11.15 to 14.12.15	Totals. Eight months.	Position in Competition.
		LIGHT BREEDS.				
		DRY MASH.				
80	White Leghorns ..	W. H. Robbins	1,013	138	1,151	1
68	" ..	H. McKenzie and Son ..	900	156	1,056	2
79	" ..	Lysbeth Poultry Farm ..	845	137	982	3
64	" ..	W. M. Bayles	839	127	966	} 4
63	" ..	A. H. Padman	814	152	966	} 4
69	" ..	E. MacBrown	837	128	965	6
76	" ..	A. A. Sandiland	813	149	962	7
62	" ..	Benwerren Egg Farm ..	789	155	944	8
66	" ..	E. A. Lawson	815	109	924	9
78	" ..	H. Hanbury	811	108	919	10
72	" ..	Mrs. E. Zimmermann ..	790	123	913	11
61	" ..	Mrs. H. Stevenson ..	784	127	911	12
65	" ..	Thirkell and Smith ..	770	136	906	13
67	" ..	C. C. Dunn	746	147	893	14
71	" ..	Moritz Bros.	745	143	888	15
73	" ..	C. L. Lindrea	671	108	779	16
77	" ..	South Yan Yean Poultry Farm	653	125	778	17
74	" ..	J. H. Gill	587	98	685	18
75	" (5 birds)	Fulham Park	564	113	677	19
		Total	14,786	2,479	17,265	
		HEAVY BREEDS.				
		WET MASH.				
86	Black Orpingtons ..	C. E. Graham	941	136	1,077	1
97	" ..	Marville Poultry Farm ..	919	114	1,033	2
100	" (5 birds)	J. H. Wright	869	111	980	3
85	" ..	H. H. Pump	846	122	968	4
81	" ..	Mrs. T. W. Pearce ..	876	86	962	5
89	Rhode Island Reds	E. W. Hippe	832	121	953	6
93	Black Orpingtons ..	L. W. Parker	822	121	943	7
88	" ..	J. McAllan	817	101	918	8
92	" ..	J. Ogden	767	150	917	9
91	" ..	A. Greenhalgh	773	118	891	10
99	" ..	L. McLean	764	116	8·0	11
90	" (5 birds)	Oaklands Poultry Farm ..	787	91	878	12
87	" ..	W. C. Spencer	779	82	861	13
84	" ..	Cowan Bros.	749	103	852	14
94	" (5 birds)	D. Fisher	741	64	805	15
95	Silver Wyandottes ..	W. H. Forsyth	689	86	775	16
98	Faverolles ..	K. Courtenay	642	126	768	17
83	Black Orpingtons ..	G. Mayberry	620	99	720	18
96	White Orpingtons ..	Stranks Bros.	546	36	572	19
82	White Wyandottes	J. B. Brigden	460	94	554	20
		Total	15,230	2,077	17,307	

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ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

CULTIVATION.

The necessity for constant surface cultivation is apparent every summer, but more so in dry seasons. Not only in non-irrigable districts is this a necessity, but also in those districts where the trees can be watered, and more so in the latter case. In irrigated orchards the tendency of the soil, as a result of artificial waterings, is to set and harden. Consequently, stirring the surface must be resorted to, in order to keep up a good mechanical condition of the soil, and also to prevent loss of irrigation water by evaporation.

In non-irrigable orchards the cultivation is necessary to conserve what water has entered the sub-soil, as a result of the winter and spring rains. The soil crust should not be allowed to form. Summer showers are not alone the cause of these formations; dry weather conditions cause the soil to consolidate, and any tramping or vehicular traffic tends to harden the surface, and thus to allow the escape of moisture the trees most need.

SPRAYING.

Spraying for codlin moth will require to be very thorough. A spraying should be given during the second week in January, and another in a month's time. All infected fruit should be picked from the trees, or gathered from the ground, and destroyed by boiling. It is often a common practice to place the infected fruit in heaps, and attempt to destroy the larvæ by building a fire on top of the fruit. This method cannot be too strongly condemned, as it is almost inevitable that a number of the larvæ will escape. The only way to properly deal with such fruit by burning is to have it burnt in a furnace; failing this, boiling is the surest method of extermination when the larvæ are in the fruit. The caterpillars and chrysalids should be searched out of their hiding places under the bark, in the crevices of the tree, &c. All bandages should be well cleaned, and no chance whatever given to the insects to develop into the second brood.

Owing to the cool weather experienced during the season, woolly aphis is becoming prevalent, particularly in sheltered situations. It is advisable to free the trees as much as possible of this pest now, as, if left until the winter, it will destroy a large number of buds on the trees. A strong tobacco solution, any lime spray, resin wash, or kerosene emulsion will easily kill the insect.

FUMIGATION.

Citrus and other evergreen trees that are attacked by scale insects should be freed from the scale at this time. Although spraying with such mixtures as resin compound, crude petroleum emulsion, sulphur, lime and salt emulsion will do good work in keeping the scale insects in check, the only effective means of complete eradication is by fumigation. The trees are enclosed in a tent which will prevent the escape of any

gas through its texture. This gas is generated inside the tent, and the tent is kept over the tree for a period of from half to three-quarters of an hour. The best remedy is hydrocyanic gas, which is generated by placing cyanide of potassium in a mixture of sulphuric acid and water. Both the cyanide and the gas are deadly poison, and every care should be exercised in using them.

Summer Pruning.

Summer pruning should now be carried out, and care should be taken that as much of the leafage as possible is retained on the trees. Unduly long laterals of fruiting trees may be shortened back, always cutting to a leaf. Unnecessary terminal leader growths, of which there are sometimes three or four, all strong growing, may be reduced to one, retaining this one as a leader. In no case should this growth be cut or interfered with in any way.

The results of these cuts will be to divert the sap, which was flowing into growths that would subsequently be pruned, into more profitable channels, so that weak buds and growths may be strengthened and induced into fruit bearing.

The Vegetable Garden.

The work in this section is much the same as in the flower garden. Frequent waterings, good mulching, and regular soil stirring will be the work for the month. As soon as any bed is cleared of vegetables, it should be manured and well dug over in preparation for the next crop. Deep digging is always desirable in vegetable growing. If any pests such as aphis, caterpillars, or tomato weevil have been present, it would be advisable to burn all the crop refuse, to destroy any insects that remain, and to give the plot a good dressing of gypsum or Clift's Manurial Insecticide.

Keep the tomatoes well watered and manured, pinching out surplus and strong growing laterals. In early districts the onion crop will be ripening. In late districts, or with late crops, the ripening may be hastened by breaking down the top. An autumn crop of potatoes may be planted. Cabbage, cauliflower, lettuce, and celery plants may be planted out.

The Flower Garden.

January should be a busy month in the garden. The waterings will be constant and frequent, and after every watering the surface should be well loosened and stirred with the hoe, to keep it moist and cool. More cultivation and less water is a good rule to be observed. If the hoe be used more and the hose less in summer, greater benefits will accrue, and the water bill will be considerably reduced. Mulchings with straw, grass, &c., are very useful just now. The mowings from lawns form valuable mulching; waste tobacco stems are also good as a mulch.

Dahlias, chrysanthemums, and other tall growing slender herbaceous plants will require support in the way of stakes, they will also need mulching considerably. These plants should receive no check

whatever, but should be continued with a regular, even growth right through the season. Another desideratum is that the soil should be well drained. Plants of all descriptions thrive far better in well-drained soils, and they require a far less amount of water.

Dahlias should be kept growing with only a minimum supply of water, and also with a spare amount of feeding. It is not wise to water them too freely until the end of February. The plants should make a slow, thrifty growth till that time, encouraged by constant cultivation with the hoe, rather than with watering. Afterwards, watering, feeding, and the encouragement of surface rooting may proceed.

A sharp look-out should be kept on these plants for attacks of red spider. If this insect appears, a good spraying with tobacco solution or benzole emulsion should be given to the plants.

Constant watch will need to be kept for the various small caterpillars that attack the buds of these plants. Spraying with a weak solution of Paris green and lime, or similar insecticide, will be useful; hand-picking should also be resorted to.

FOXES KILLING YOUNG LAMBS.

It occasionally occurs that a very simple contrivance may be used to effectually combat a serious difficulty; but its very simplicity is apt to give rise to scepticism in the minds of many who should be only too glad to avail themselves of its use, and through this its value may remain untested. Instances of this have occurred in connexion with the idea of using bells on lambing ewes to scare foxes. It is fully fifteen years since this was first mentioned in the agricultural notes of the Melbourne weekly press, yet it is so simple a device that its effectiveness is questioned, and consequently it is seldom tried or spoken of. It is, however, a fact that if ordinary bullock bells, costing about 1s. each, are strapped on the necks of two or three ewes per 100 in the lambing flock, there will be no trouble with foxes killing the lambs. The bell should be put on close up to lambing date, and taken off again after the lambs have recovered from the marking, and are fairly strong and active, for to leave the bells on throughout the year is likely to result in the foxes becoming accustomed to the noise.

So little publicity has been given to this simple method of protecting the lambs, that it is still unheard of in many quarters even to date. In the lambing season, 1914, the foxes were causing considerable losses on the Mount Cotterill Estate, Rockbank; but on hearing my experience with bells, Mr. Charles Holden at once put them into use, with the result that the lamb killing stopped, and they have been used there effectively again this year. Mr. Holden states that through his experience several other sheep-owners have tried the device this year, and they, also, have proved its efficacy.

REMINDERS FOR FEBRUARY.

Live Stock.

Horses: *At grass.*—Supplement dry grass, if possible, with some greenstuff. Provide plenty of pure water and shade shelter. *In stable.*—Supplement hard feed with some greenstuff, carrots, or the like, and give a bran mash once a week at least. Avoid over-stimulating foods, such as maize and barley. Give hard

feed in quantities only consistent with work to be performed. Stable should be well ventilated, and kept clean. When at work, give water at short intervals. Always water before feeding.

Cattle.—Provide succulent feed and plenty of clean water easy of access; also shade and salt lick in trough. Have each cow's milk weighed and tested for butter fat regularly. Rear heifer calves from those that show profitable results. Give milk at blood heat to calves. Keep utensils clean or diarrhœa will result. Do not give too much at a meal for the same reason. Give half-a-cup of limewater per calf per day in the milk. Let them have a good grass run or lucerne, or half-a-pound of crushed oats in a trough. Dehorn all dairy calves except those required for stud or show purposes.

Pigs.—Sows about to farrow should be supplied with short bedding in well-ventilated styes. All pigs should be provided with shade and water to wallow in. There will be plenty of cheap feed available now. Oats are quoted at 2s., and barley at 2s. 4d. per bushel, which is far cheaper than pollard at £7 per ton. Refer to articles on breeding, feeding, &c., in *Journals* for April 1912, June 1913, May 1915. Pigs should be highly profitable animals to feed now.

Sheep.—Longwool crossbred ewes, known as "three-quarter breds" or "second cross", usually not in season until now, are this year earlier than usual. Downs rams can be joined for export lambs. Merino rams for wool growers, breeding ewes, and grazing sheep, or other white-faced longer-woolled breeds for export lambs if the season be favorable, or for holding over if the reverse. Should there be among the rams to be used any distinctly inferior to the others, keep them back for twenty-one days, give the best rams the first three weeks, but be sure the ewes are in season. Narrow, inferior-framed rams are almost invariably active, rapid workers compared to sheep of more substance. Keep salt available. *Drench any weaners scouring. If necessary to feed, do not wait until in-lamb* ewes are weak before commencing. When on continuous dry feed, sheep move directly off camp to water towards evening each day before feeding. When water becomes inferior, or available to in-lamb ewes irregularly, losses with both ewes and lambs before and after lambing appears to be more prevalent.

Avoid moving good-woolled sheep in heat and dust.

Poultry.—Chickens should now be trained to perch; they will be more healthy and less liable to develop wry tails.

Provide plenty of green feed and give less grain and meat. Avoid condiments. Keep water in cool shady spot and renew three times each day. Keep dust bath damp.

Birds showing symptoms of leg weakness should be given 1 grain of quinine per day (three months old chickens, ½ grain) and plenty of skim milk.

Cultivation.

Farm.—See that haystacks are weatherproof. Cultivate stubble and fallow, and prepare land for winter fodder crops. Get tobacco sheds ready for crop. In districts where February rains are good, sow rye, barley, vetches, and oats for early winter feed.

Orchard.—Spray for codlin moth. Search out and destroy all larvæ. Cultivate the surface where necessary and irrigate where necessary, paying particular attention to young trees. Fumigate evergreen trees for scale. Continue budding.

Flower Garden.—Cultivate the surface and water thoroughly during hot weather. Summer-prune roses by thinning out the weak wood and cutting back lightly the strong shoots. Thin out and disbud dahlias and chrysanthemums. Layer carnations. Plant a few bulbs for early blooms. Sow seeds of perennial and hardy annual plants.

Vegetable Garden.—Continue to plant out seedlings from the seed-beds. Sow seeds of cabbage, lettuce, cauliflower, peas, turnip, and French beans. Keep all vacant plots well dug.

Vineyard.—February is the best month for the "Yema" or Summer bud graft. Select scion-bearing vines; mark with oil paint those conspicuous for quality and quantity of fruit, regular setting and even maturity.

Sulphur again, if necessary, but avoid applying sulphur to wine grapes too short a time before gathering.

Cellars.—Prepare all plant and casks for the coming vintage. An ounce of bisulphite of potash, or a couple of fluid ounces of bisulphite of soda solution, to each bucket of water used to swell press platforms, tubs, &c., will help to keep it sweet. Keep cellars as cool as possible. Complete all manipulations so as to avoid handling older wines during vintage.

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SEED WHEAT.

VARIETIES FOR DISTRIBUTION AMONG FARMERS.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

Owing to the disastrous drought of 1914 and the consequent failure of the crops, considerable difficulty will be experienced in securing for the 1916 seeding wheat true to name and free from an admixture of foreign varieties. The abnormal scarcity of seed last year resulted in large areas being sown with seed of inferior quality, which in normal years would have either been gristed or used for the feeding of stock.

In view of this, farmers will be interested to know that graded seed of some sixteen different varieties is available for distribution by the Department of Agriculture.

Importance of Good Seed.

The importance of sowing and producing good seed is not sufficiently appreciated by the average wheat-grower. On the majority of farms the most that is done is to reserve the best grown and cleanest part of the crop for next season's seed. This is a step in the right direction, but is not sufficient to enable the grower to obtain the maximum yields the soil and climate will permit.

Value of Grading.—In a number of cases the process of preparing the seed is carried a stage further, and the whole of the seed is passed through a grader, with the object of eliminating small, shrunken, as well as immature seed. Though it is generally admitted that such treatment is advantageous, a considerable proportion of the wheat-growers fail to grade their seed each year.

A typical illustration of the value of grading may be seen from the results obtained at the Wyuna State Farm. Four plots were sown side by side under identical treatment as regards manuring and cultivation. One plot was sown with normal Federation seed just as it came from the

harvester. The remaining three plots were sown with firsts, seconds, and thirds seeds obtained from this normal seed by a centrifugal barrel grader. The results were as follow:—

Grade I., 28 bushels 6 lbs.
Grade II., 27 bushels 53 lbs.
Normal, 25 bushels 27 lbs.
Grade III., 23 bushels 50 lbs.

Thus for the trifling cost of, say, 6d. per bushel an increase of 2½ bushels per acre, worth at 4s. per bushel 10s. per acre, was obtained.

While possibly the majority of farmers choose the best grown and cleanest of their crop for seed, and a large number regularly submit this well-grown seed to a process of grading, it is safe to say that only a very small percentage of wheat-growers carry the process a stage further and subject the growing seed crop to deliberate, systematic, and continuous selection, with the object of increasing the prolificacy of the variety from year to year.

Seed "running out."—Little wonder then that we hear farmers complaining that their seed is "running out," and seek a remedy in a change of seed. Such a change of seed may or may not be beneficial. If the seed is secured from a farmer equally careless in the treatment of the crop no material improvement can possibly result. If, on the other hand, the seed is secured from a source where grading and systematic selection go hand-in-hand, such a change will be accompanied by immediate and satisfactory results; but unless pains are taken to maintain and improve the prolificacy of the seed the benefit arising from the change will only be temporary.

Long experience and careful experiment have demonstrated that the best results are obtained by developing locally-grown seed rather than relying periodically on changes of seed from localities differing considerably in soil and climate.

There is no reason why seed should degenerate, even though it be sown year after year on the same farm. Indeed, by the application of systematic selection, the quality and prolificacy of the seed may not only be maintained, but increased. It is curious to note that whilst farmers are very keen on improving their stock by careful selection, they do not appear to give much thought to the possibilities of improvement of their crops by somewhat analogous methods of selection. Certainly the improvement is slow, as with stock, but it is none the less sure.

Selection of Onion Seed and Beet Seed.—Though the wheat-grower may not be aware of the improvement effected by systematic selection of the wheat crop, the same cannot be said of the onion-grower and beet-grower. For many years past it has been a regular practice in raising sugar beets to sow seed obtained by rigorous selection from the very best plants. The raising of selected beet seed is now a most elaborate process, and it is owing principally to the increase in the prolificacy and the percentage of sugar of the beet that the industry has been able to compete with cane sugar grown by black labour in the tropics. Selection has improved the shape of the roots, increased the yield per acre, and raised the percentage of sugar in the beet.

With the onion crop rigorous selection is applied. The demand for the highest class of onion seed in this State is such that a number of

expert growers make a speciality of the business. One prominent grower of onion seed in the Beeac district regularly disposes of his whole crop of seed at just double the rates for ordinary seed.

View of Bulk Area of Dart's Imperial Seed Wheat, Rutherglen Experiment Farm.

View of Bulk Area of Penny Seed Wheat, Rutherglen Experiment Farm.

With such prices both the grower of selected onion seed and the farmer are satisfied; the former because he gets a price commensurate with his efforts and the labour he puts into the work, and the latter

because experience has taught him that the selected seed will return an increased tonnage over the unselected seed.

Selection applied to the Wheat Crop.

If such results apply to root crops, why not to wheat? As a matter of fact, similar improvement may be obtained with cereals. As a root crop, however, is generally of far higher value than a cereal crop, and as the rental for onion land is invariably much higher than for wheat land, the incentive and the necessity for systematic production of prolific types is greater in the case of the onion-grower than with the wheat-grower. But even with the wheat-grower, costs of production are rapidly rising, and necessity, sooner or later, will compel him to increase the net profits per acre.

One of the surest and unfailing aids will be the bestowal of adequate care on the preparation and selection of the seed. His fourfold task in this direction will be—

(1) To find out the varieties of wheat best suited to the local conditions. This can be done by experimentation.
(2) Grow these varieties on the cleanest and best worked fallows.
(3) Grade the seed each year with a suitable grader, and sow only the best grade of seed.
(4) Adopt a definite policy of systematic selection for improving the prolificacy of the chosen varieties.

An important and necessary task for every progressive farmer is to make himself familiar with the leading types of wheat grown in the State. Soil conditions fluctuate so widely in different parts of the State, and even on parts of the same farm, that it is not possible to indicate, except in a general way, the varieties that would be suitable to any specific locality. Moreover, new varieties are continually coming into cultivation; hence each farmer should be an experimentalist, and carry out tests on a small scale with the leading wheat varieties and any new types that come on the market, with the object of determining in a practical manner the varieties best suited to his conditions. It is not uncommon to find the difference in yield between two varieties of wheat, grown on the same farm under identical conditions, is sufficient to pay the rent and interest on the land on which the crop is grown.

The necessity for grading the seed has already been alluded to. There are still a number of farmers who believe that small shrivelled grain is as good for seed purposes as full plump grain. The result of the following test may assist in undermining this belief. Last season firsts and thirds Federation seed from a centrifugal barrel grader were sown alongside one another under identical conditions at the Rutherglen Experiment Farm in plots 30 chains long and one chain wide. Though sown late in June, the yield from the first grade seed was 26½ bushels per acre, while the third grade seed yielded only 20¾ bushels. The expenses of production were the same in both cases, yet the prime grain gave an increase of 5½ bushels per acre.

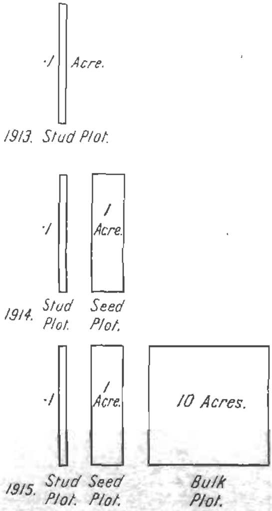
Some Results of Selection.—So far as raising the prolificacy of seed by systematic selection is concerned, the evidence obtained at the Experiment Farms is convincing. Thus, at Longerenong, selected Federation seed has given increases of 12 per cent. to 25 per cent. in yield over

ordinary Federation seed. In 1915, the selected Federation seed gave a yield of 52 bushels per acre, as compared with 45 bushels for ordinary Federation seed sown alongside. At Rutherglen a block of 4½ acres of selected Federation seed gave 204 bushels of grain, a yield of over 45 bushels per acre. No block of ordinary Federation gave over 36 bushels. The following are the yields of selected and ordinary prime Federation seed sown alongside one another for the past four years at Longerenong Agricultural College:—

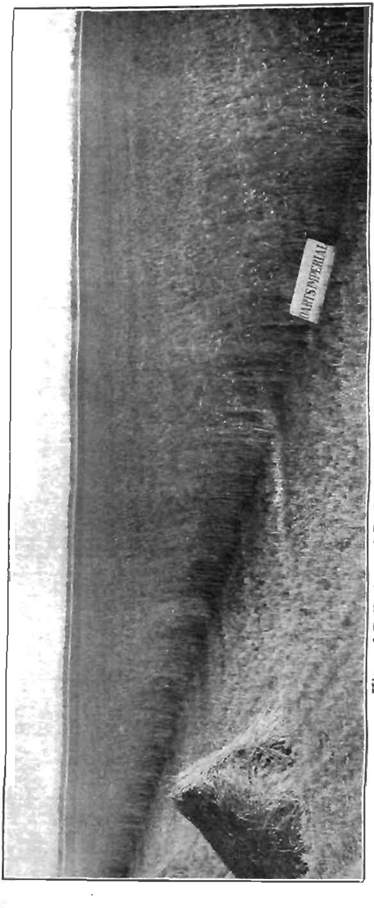
	Selected Federation. Bushels. per acre.	Unselected Federation. Bushels, per acre.	Increase in Yield through Selection. Bushels, per acre.
1912 ..	43.25 ..	34.5 ..	8.75
1913 ..	36.39 ..	24.66 ..	11.53
1914 ..	9.77 ..	5.03 ..	4.72
1915 ..	52.16 ..	46.5 ..	5.66

A Simple Method of Selection.—The methods of improving wheat by selection have already been dealt with in detail in former issues of the *Journal* (March and April, 1913), and there is therefore no need to refer to the methods in detail. A brief description of one method applied on the State farms may be of interest. The basis of the method is that the selection must be continuous and uninterrupted, and at the same time require the minimum of time and labour. The method is known technically as mass selection, and to apply it three series of plots are provided for each variety of wheat, and each year the produce of one series of plots is sown on the plots of the succeeding series.

Thus, for Federation wheat three plots are provided, namely, "stud," "seed," and "bulk" plots, respectively 1-10th, 1, and 10 acres in area. To provide seed for the stud plot about 12 to 15 lbs. of the largest and best heads of the best developed plants in a field are hand-picked and threshed. The seed is carefully graded with hand sieves, and the produce sown at seed time in a plot one drill-width wide in the "stud" plot. The following harvest the procedure is repeated, and the process of selection of the best



Diagrammatic Scheme for Improvement of Wheat at Experiment Farms by Selection.



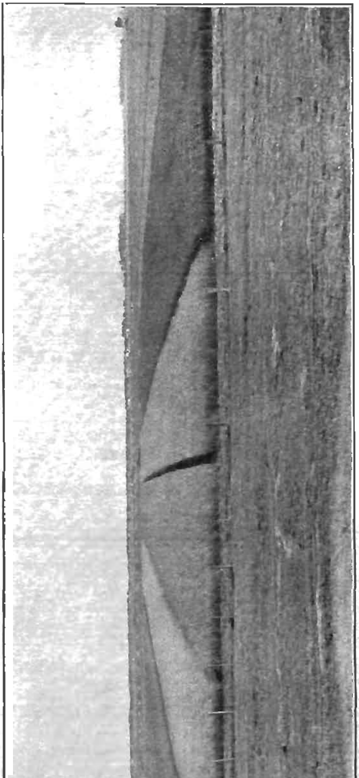
View of Bulk Area of Dart's Imperial Seed Wheat, Wyuna State Farm.

heads being made from the "stud" plot. The selected heads are again sown the following year in the "stud" plot, whilst the rest of the "stud" plot is stripped and the seed sown on the "seed" plot, 1 acre in area, the following year. The third year the process of selection will be complete. As before, selected heads are again taken from the *élite* plants of the "stud" plot for a corresponding plot of the following season. The rest of the "stud" plot is harvested and sown on the 1-acre "seed" plot, whilst the produce of the "seed" plot is sown on the bulk plot of 10 acres to insure the seed for the whole farm for the following year. In this way there is a regular rejuvenation of seed each year, and the full area is ultimately sown with seed which sprung from the best selected plants each year. The ultimate effect of such selection will become clearly apparent, and increased yields may confidently be anticipated. What the increase will be depends on the per-

sonality of the individual performing the work of selection.

The scheme rests on the principle that the best and most prolific types of plants are annually selected as the progenitors of the strain. All the plants actually selected will not, of course, be superior. Some that are included may have been accidentally favoured in the struggle for existence by having more room to develop or a greater supply of plant food to develop than others. But with careful attention on the part of the operator the greater number of plants chosen will prove to be inherently superior, and not merely the expression of a favorable environment.

It is not claimed that this is the best method of improving the variety, but it is a method within the reach of every farmer. It has been practised extensively during the past four years, and has resulted in a material improvement in yield. Moreover, it does not involve much added work.



View of Seed Wheat Plots, State Research Farm, Werribee. The produce of these plots is sown on the bulk areas for distribution as seed.

Wheat Varieties.

Three years ago a series of co-ordinated tests were commenced on the Rutherglen, Werribee, and Wyuna State Farms and the Longerenong Agricultural College. Every available variety of wheat was tested in field plots, with the object of determining the varieties most suited to local conditions. At the same time a commencement was made to raise pure bred seed, true to type, and free from any admixture of foreign varieties, of twenty of the most prolific types that were in general cultivation. Moreover, an effort was made to raise the standard of each variety by subjecting it each year to a rigorous and continuous selection by methods to be presently described.

View of "Stud Selection Plots," Rutherglen Experiment Farm. The produce of these plots is sown on the "Seed Plots," which in turn furnish material for the bulk areas. The prolificacy of each variety is maintained by selecting year by year the best plants appearing in these plots. (Vide diagram, page 69.)

As a result, the Department is now able to distribute a considerable quantity of each of these varieties among farmers, which will furnish each farmer with material from which he can ultimately raise sufficient seed to sow his whole farm.

For the purpose of convenience, the varieties that are being distributed may be classified as follows:—

Early Wheats.—College Eclipse, Comeback, Gluyas, King's Early.

Mid-season and Late Wheats.—Bayah, Commonwealth, Currawa, Dart's Imperial, Federation, Major, Marshall's No. 3, Penny, Yandilla King.

Hay Wheats.—Hugenot, Warden, Zealand Blue.

The following varieties were also tested, but the yields have not been consistently high enough to justify further trials:—Bunyip, Thew, Genoa, Viking, Firbank.

Notes on Varieties.

The following notes on these varieties may prove of use:—

COLLEGE ECLIPSE.—This variety was evolved at Roseworthy from Carmichael's Eclipse—a variety very popular in the northern districts of South Australia. It does not mature as quickly as Gluyas or King's Early, but is a good growing variety of fair stooling capacity, and fairly resistant to fungus diseases. The ear is dark-brown in colour, almost beardless, and holds the grain well. Though somewhat unattractive in appearance, it has given good returns in departmental tests, and will probably prove a good wheat to grow in the drier districts.

COMEBACK.—This is an early variety, of fair stooling capacity, moderately tall, with clean, hollow straw, and makes a very nice sample of hay. The ears are creamy-yellow, beardless and smooth, of moderate length, fairly compact, but with a long tapering tip. The grain is small, somewhat shotty in character, with hard semi-translucent endosperm. The grain is of high milling quality, and is eagerly sought by millers, making a good percentage of high quality flour very suitable for blending purposes. It has been sold on the Sydney and Adelaide markets at various times at 3d. to 6d. per bushel above ordinary f.a.q. wheats. The Victorian Mill-owners' Association agreed to purchase Comeback wheat at 3d. above ordinary market rates. It has the reputation of being a shy yielder, and on this account is not popular with Victorian farmers, though in some of the drier districts it has done remarkably well.

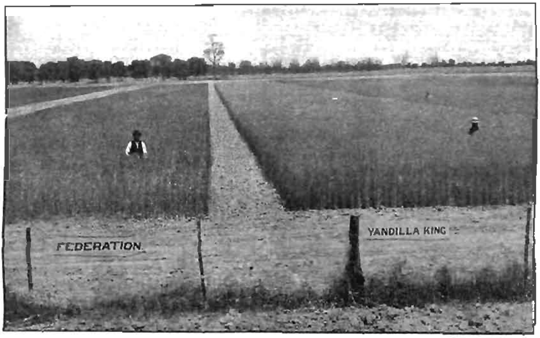
GLUYAS.—This variety is very popular in the Mallee districts of South Australia on account of its early maturity, general immunity from disease—particularly its rust-resisting powers—and its capacity for yielding well in dry seasons. It is a vigorous, moderately tall growing, early variety, of fair tillering power. It is, however, somewhat weak in the straw. The ears are dark-bronze in colour, moderately compact, and possess a slight tip beard. As the grain approaches maturity the dark heads become pendent, but do not shell on account of the firmly closed enveloping glumes. It is a very useful variety for sowing in dry districts in a late season, and is one of the most promising of the early varieties for Mallee districts. Large quantities of seed of this variety have been sent to South Africa, where rust-resistance is a quality that is highly prized. There have been a number of inquiries from Queensland regarding this variety.

KING'S EARLY.—This is another very popular early variety in South Australia Mallee country, and yields well in dry seasons. It is a selection made many years ago by the late Joseph King, of Georgetown, South Australia. It is a vigorous tall-growing variety, of moderate stooling capacity, possessing semi-solid straw, with a fair amount of flag. The ears are beared, white, somewhat open, and the grain large, plump, and of low strength. In spite of its beard, it is prized as a hay wheat on account of the solidity and sweetness of its straw, and the capacity of retaining its colour well. It is a very old variety, but during recent years it has been greatly improved in yielding capacity by selection. It is useful for late sowing when seeding operations are backward.

BAYAH is a cross-bred wheat with improved Fife and Jonathan parentage. It is a mid-season variety which very closely resembles

Federation in the colour of the chaff and the short, upstanding straw. It is a very vigorous grower, of good stooling capacity, with well-developed, shapely dark-brown, compact ears with clubby tips. The chaff is smooth, but the spikelets near the tip are slightly awned. The grain is plump, soft, and white. On account of the short stiff straw it is not suited for hay, though its grain yields have been very satisfactory.

COMMONWEALTH.—This is one of the new varieties produced by Mr. Pye, Principal of the Dookie College, by cross-breeding. It is not unlike Federation, both in habit and general appearance, being short in the straw and possessing a bronze beardless head, somewhat prone to shed its grain. It is a promising variety, has done well in departmental tests, and is worthy of trial in the northern areas. It has yielded well during the past season.



View of "Seed Plots," Rutherglen Experiment Farm. The produce of these plots is sown on the bulk areas for distribution as seed.

CURRAWA.—This is another of Mr. Pye's crossbreds, and in the field is an attractive looking wheat. It is a free-growing variety, of good tillering power, producing a fair amount of straw, and has bald, creamy-white, compact, square, well-developed heads. This variety has given very good yields in the northern areas, and is likely to achieve considerable popularity in these districts. It should certainly be worthy of trial by farmers in the northern areas, and may be expected to give good yields in seasons with late spring rains.

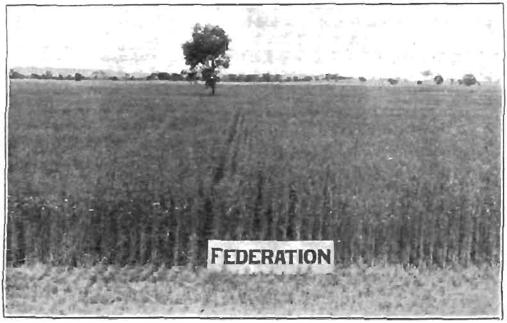
DART'S IMPERIAL.—This popular variety was originated by Mr. Thomas Dart, of Nhill, Victoria, formerly of Lucindale, South Australia, and is a selection from a purple straw variety. It is one of the oldest varieties in general cultivation at the present time. It is a good all-round grain and hay wheat, and is a very reliable yielder in most wheat districts. It is a tall-growing variety, with good stooling powers, but hollow stemmed, and possessing considerable

foliage. The heads are well developed, square and compact, with broad, smooth, cream-coloured spikelets, somewhat crowded towards the tip, giving the top a club-like appearance. The chaff is smooth, but possesses slight awns towards the summit of the head. The grain is soft, white, and mealy, and not of high strength. The grain is easily milled, and it belongs to the weak flour group of wheats, though the colour of the flour is excellent. In Departmental variety tests the yields of Dart's Imperial have usually stood out prominently, and confirm the opinion that this variety is a good prolific standard type for most of the wheat areas.

FEDERATION.—This is, without question, the most popular and prolific variety of wheat in general cultivation at the present day. It was produced by the late Mr. Farrer, Wheat Experimentalist, of New South Wales, from a cross between Purple Straw and Yandilla. Yandilla is a cross between Improved Fife and Etewah, an Indian variety. The production of this wheat was probably the greatest of Mr. Farrer's many triumphs in wheat breeding, for none of his many successful crossbred wheats have enjoyed such a wide measure of popularity as Federation. Indeed, during the last six years the golden yellow characteristic of old-time Australian harvest fields has been gradually changed to a dull bronze through the ever-increasing popularity of Federation wheat. This popularity has been won by sheer merit, for Federation, when seen in the field for the first time, is decidedly unattractive in appearance, especially when grown side by side with the showy wheats of the Purple Straw type. Most farmers in growing it for the first time have expressed great surprise at the yielding capacity when the wheat was taken off, for the yield invariably exceeded the expectations based on pre-harvest estimates. As a matter of fact, Farrer's main aim in producing Federation was to produce a variety suited to the Australian methods of harvesting with the stripper. Federation is a short, erect-growing variety of moderate stooling capacity, with broad, semi-erect, light-green foliage. It has short, upright, stiff straw, unaffected by some of the most violent storms. It may be regarded as a variety in which there is a maximum of grain to the minimum of straw. Its chief feature is its extraordinary prolificacy. It was not intended for nor recommended as a hay wheat. It is essentially a grain yielder. It possesses a bold, square, beardless, compact head, with a peculiar and characteristic bronze cast, broad, well-developed, smooth spikelets. As might be expected, there are numerous strains of Federation on the market. In many, the original squareness and blocky nature of the head, characteristic of the variety when it emerged fresh from the breeder's hands, have to a large extent disappeared. Federation is susceptible to fungus diseases—especially rust and flag smut, and, to a lesser extent, "take all" (*Ophiobolus graminis*). Were it more disease resistant and earlier in maturing, it would be ideally suited for the more arid areas. The grain is very liable to suffer from bleaching, especially in a showery harvest, owing to the fact that, unlike many of the older wheat varieties, the ear stands upright when ripe, and allows rain to readily penetrate the ear. Its grain is soft, white, and plump, and yields a good percentage of flour of creamy-yellow colour. Though the strength of the flour is considerably lower than Comeback and Bobs, it is higher than the Purple Straw wheats.

MAJOR.—*A late maturing variety, with good stooling powers,* creamy-yellow, compact, bald heads, spikelets rather densely packed near the summit. This is a new variety, bred by Mr. Pye, of Dookie College, and promises to be of value for late districts.

MARSHALL'S No. 3.—This is one of a large number of varieties originated by that successful wheat breeder, Mr. R. Marshall, late of Templars, South Australia. It is a late wheat of good tillering capacity, but rather slow growing when young, with a somewhat spreading habit, and broad, dark-green, drooping leaves. It is somewhat rust resistant, but its late maturity is an objection for the drier districts. The straw, when ripe, has a purplish tinge, stands up well, and bears a beardless, somewhat open head of fair length, carrying smooth, broad spikelets,



View of Bulk Area of Federation Seed Wheat, Rutherglen Experiment Farm.

with a slight tip beard. The grain is soft, white, plump, and of fair size, and of fair milling quality. It is very popular in South Australia, New South Wales, and Queensland, and has been very widely grown for hay.

PENNY.—This variety was introduced from Bungaree, South Australia, by Mr. E. H. Lascelles, Geelong. It has done remarkably well in the Mallee. Mr. Lascelles grew it at Tyrrel Downs in 1912, and averaged 7 bags to the acre on a year's rainfall of 9.9 inches, the next best variety giving but 5 bags.

In 1914, though only 5 inches of rain fell for the year, the average yield of Penny was 5 bushels per acre, whilst no other variety gave more than 2½ bushels.

It is a strong upright-growing variety, maturing rather late, and looks very attractive in the field. The heads are well developed, compact, beardless, creamy-white in colour, with rather densely crowded spikelets near the summit.

It is likely to become a popular variety, and has the dual qualification of being a good grain yielder and a fair hay wheat, and, in addition, it appears to give satisfactory returns in the driest seasons.

YANDILLA KING.—This is another of Mr. Marshall's crossbred wheats, and is a half-sister to Federation. It was obtained by mating Yandilla and Silver King (a white-strawed variation of Marshall's No. 3). It is a late wheat, with good stooling propensities, and, like Marshall's No. 3, is a somewhat slow grower in the early stages. The ripe straw is stiff, hollow, and upright, on the short side, bearing large, well-developed, shapely, beardless heads, creamy-white in colour, with broad, close-set smooth spikelets. The chaff adheres closely to the grain, and renders stripping somewhat difficult. The ear is slightly tip bearded, and the grain large, plump, medium hard, white, and of good milling quality. It has been a consistently heavy yielder, and has done well in departmental variety tests, and must be regarded as one of the most prolific and reliable grain varieties in general cultivation.

View of Bulk Area of Yandilla King Seed Wheat, Rutherglen Experiment Farm.

HUGUENOT is a very tall-growing wheat of the macaroni or durum class. It stands up well, frequently growing to a height of 6 or 7 feet. Its straw is practically solid, and very sweet in character. It is a poor stooler, and must, therefore, be sown very thickly. This is the more necessary on account of the large size of its grain. Its early growth is erect, and of light-green colour, and the leaves broad and stiff. Unless sown thickly, the straw goes up like miniature bamboos. The head is very dense and compact, being dark-brown in colour, with a cast of purplish black. The spikelets are densely crowded, and give the ear a club-like appearance. The grain, which is long, hard, horny, angular, and slightly pinched, adheres closely to the chaff, and makes the wheat difficult to strip. This difficulty is increased by the fact that the wheat is invariably a tall grower, and possesses very prominent top nodes, which latter often choke the comb of the stripper or harvester.

It is a macaroni wheat, and not a milling wheat. Its gluten content is high, but the colour of the flour is very objectionable. It is a very poor yielder, and will not pay to grow for grain at f.a.q. rates. It is essentially a fodder variety, being grown either for hay or ensilage. As a hay wheat it gives an exceedingly heavy cut, yields up to 4 and 5 tons per acre being frequent in South Australia. Mixed with varieties like Baroota Wonder, Majestic, or Calcutta Cape Oats, it gives heavy cuts of good quality sweet hay. It is smut resistant, and relatively rust resistant. The cost of seed wheat of this variety is usually high, but it could not be produced with profit at ordinary f.a.q. rates on account of the low yield of grain per acre. It is suitable for forage or hay purposes, but should not be grown for grain.

WARDEN.—A late-maturing variety, noted for its fine hay qualities. A tall-growing wheat, with nice thin straw, makes good quality hay, and retains its colour well. The head is open, beardless, white, and tapering; grain hard, dark red, and glutenous. It is a very popular hay wheat in Victoria.

ZEALAND BLUE.—A cross between Tardent's Blue—a good hay wheat—and Zealand—a variety of the Lammas type. It is a tall-growing, medium late variety, with good stooling powers, and strong straw. This variety has done well as a hay variety, especially in the cooler wheat areas. The head is long, beardless, slightly tapering, with characteristic velvety chaff. The grain is large, plump, and medium hard, of very attractive appearance, and of good milling quality.

It should always be remembered that the best cows pay the best for looking after. They pay for better food and more of it than the poor ones, and should have the greatest amount of attention generally. The capability of responding to this good treatment is greater than that of a poor milker.

Senator Sherman, of Illinois, United States of America, said in a recent speech that the day had gone by when the boys who were not bright enough to make lawyers or doctors stay on the farm. Nowadays it is the boy who is not smart enough to make a successful farmer who goes to town to become a doctor or lawyer.

Cows with their third or fourth calves should be carefully observed after calving, especially if they are deep milkers, as at this period they are very apt to develop milk fever. If a cow is lying down with her head turned into her side, you should go to her and place her head in a different position. If she persists in returning it to the old position again, you may know that she has milk fever.

NHILL AGRICULTURAL SOCIETY ANNUAL CROP AND FALLOW COMPETITIONS, 1915.

Report of the Chief Field Officer, Mr. Temple A. J. Smith.

The Secretary, Nhill Agricultural Society.

SIR,

It affords me much pleasure to submit herewith my report on the Nhill Crop and Fallow Competition for the year 1915. The elimination of the competition for best farms, owing to the serious drought of 1914, has naturally robbed this function of a considerable amount of its usual interest, and though the Society probably acted wisely under the circumstances, the wonderful recuperative powers of the district, as evidenced by the very fine crops and natural growths seen during the recent inspection, go to show that the farms might well have competed again in 1915 without loss of prestige as compared with previous years.

General Impressions.

The marvellous recovery in one short season from the greatest drought ever experienced is perhaps the outstanding feature of the past two years. The crops now in the field are exceptionally fine, and the area to be harvested is considerably above the average. The prolonged ripening season just experienced will give the wheat crops every opportunity of filling well, thus causing heavy yields of good plump grain. Oat crops are also finer than usual, and an enormous quantity is being cut for hay. Some idea of the quantity taken off is conveyed by the fact that in many cases over large paddocks of 100 acres and more a ball of twine per acre was required to tie the crop; on one field of 40 acres no less than 55 balls of twine were found necessary.

In addition to the oat crops grown for hay a quantity will be stripped for grain, and here a pertinent question may be put with advantage as to the disposal of oats when prices are low, as compared with their value when fed to stock on the farm. The prevailing opinion amongst farmers is that oats will be saleable at anything down to 1s. 6d. per bushel. Victoria does not export oats to any extent, consequently, when the supply exceeds the demand values are low. When such conditions prevail, there can be no doubt that feeding oats to stock on the farm will pay better than selling at 2s., and some experienced farmers say 2s. 6d. per bushel. The effect of such a practice would be not only to make the greater profit at home, but also to maintain a better market for those who sell. With meat at high prices, and likely to remain so, the feeding of oats to stock is a still better proposition. At the present moment the supply of natural feed is in excess of the demand made upon it by stock, but the winter months will tell a different tale, and as every practical man is aware, the prices for fat stock are, generally speaking, at their highest at that time.

Another pleasing feature was the cutting of wild oat crops on a much larger scale than previously for hay. Yields of 2 tons per acre from this natural growth were not uncommon. Many of the lanes were growing wild oats which would cut $1\frac{1}{2}$ to 2 tons of hay, and in some cases crops

were cut in them of these dimensions. This practice might be extended with advantage and profit. The cost of conserving hay of this description amounts to about 10s. or 12s. per ton, consisting of cutting, carting, and stacking; as a reserve supply for bad seasons its value would be ten times that amount, while under normal conditions it would largely increase the stock-carrying capacity of the farm.

Left to ripen and shed their seed in seasons like the one being experienced, they are a menace to safety in case of fire, and the cause of many dirty crops.

Water Supply.

The drought just past has had its good effects as well as bad, as one of Nhill's most progressive farmers (Mr. E. J. Hoffman) remarked. It had forced him to put down a bore for water, a thing he should have done long before. The water so obtained is of excellent quality for stock and domestic purposes, and where used for irrigation has proved beneficial. Further, there appears to be an inexhaustible supply. The value of this sub-artesian water to the Nhill district can scarcely be over estimated; it not only means safety in times of drought in regard to water for stock, but should be largely instrumental in providing green succulent feed at all times. The rich black country, of which there is a large area, is in most cases admirably suited to the growth of lucerne and other fodder crops. Small plots of this king of fodders were seen on some farms, and there appears no reason why areas of 10, 20, an 100 acres of lucerne should not be grown under irrigation supplied by bores in the future, rendering the owners of such areas independent of the seasons, and assuring a competence on smaller holdings, in addition to which would accrue the enhanced value of the land.

With the warm climate, the rich black soil, and a sufficient supply of water, lucerne should thrive as well, or better, than in any other portion of the State. It was noticed on some farms where bores had been put down that the distributing tanks into which the water was pumped were placed on low stagings, often only a few feet from the ground. This is a mistake, as for practically the same cost the staging could be made 12 feet or more, the resulting pressure being of considerable value in the saving of time when the water is used for garden purposes, the hosing of horses, buggy, &c., and particularly in case of fire.

Losses Due to Drought.

Inquiries were made on each farm visited as to the losses sustained during the past exceptionally bad drought, and it is extremely satisfactory to be able to say that less stock was lost as the cause of the drought than was probably the case in any other of the northern areas of the State. In no case was a serious loss quoted, and though some hay was imported by individual farmers, others sold large quantities at high prices. Horses are plentiful, and no difficulty is expected in connexion with harvesting operations. When the comparative immunity from loss in this district is compared with that of other supposedly more favoured places, a field of speculation is opened as to which is really the safest part of the State in which to invest capital.

On Mr. John Dart's farm a field of grass, known locally as rye-grass was seen of exceptionally strong growth, which was highly spoken of as

a drought resister. Though resembling rye-grass, it is certainly not English or Irish rye, and being perennial in habit differs from Italian rye and Westernwolth. Samples have been submitted to the proper authorities to have the variety placed. Stock are fond of it, and thrive upon it, and as it apparently does well on sandy, black, and red soils it should be a useful acquisition to the Wimmera. A further grass that might be experimented with, especially on the black flats, is that known as Subterranean Trefoil, a very small quantity of seed, 1 lb., being sufficient per acre.

Progress Noticeable.

Though it is only three years since I had the honour of judging these competitions, a noticeable degree of progression is apparent, and this in spite of one year of the three being practically non-productive. Many new homes have been built on up-to-date plans, telephones are laid on to almost every farm of importance, new bores and dams have been put down, nice gardens and orchards surround the houses, and, generally speaking, the whole countryside looks prosperous and comfortable. Fresh land has been cleared and brought under cultivation, and unmistakably better methods are being followed in cultivation and cropping, largely as a result of the farm and crop competitions and the evidence and information they have assisted in obtaining. Some of the new homesteads have been laid out with a view to later on competing for the Society's prizes. Early fallow with careful cultivation is more general; crops in some cases have had all foreign heads culled by hand, and larger quantities of manure are being used. Hints thrown out by previous judges have been acted upon with advantage, a case in point being the making of an elevator for stack-building, made by Mr. J. Jordan, of Woorak, for Mr. Peter Bone, on the lines suggested. This machine, which is cheap, durable, and easily constructed, saves all the pitching upward of sheaves above the 14-ft. level, saving thereby time and labour.

Though many dirty crops were seen in the 300 miles traversed during the inspection of this year, those exhibited, and also some others, were cleaner than was the case in former years, and here it might not be out of place to say that many of the crops not entered for competition should have been included, both from an individual point of view, and in the general interest of the Society that is doing so much for the Wimmera. That farm and crop competitions tend to stimulate better methods and practices cannot be denied, and it is a pity that other Societies do not follow Nhill's example in this respect.

Where Improvement is Possible.

Probably the greatest improvement in farm practices in the future will be made in a better system of rotation cropping, greater use of the sub-artesian water, seed selection, and the use of increased quantities of manure. There is room, too, for better cultivation methods in many cases. The present rotation is to some extent wasteful, in that a year or two is devoted to spelling the land when the growth of certain rotation crops would bring about a quicker release of the essential plant foods in the soil, at the same time paying well for their cost in labour, manure, seed, &c. The growth of rye and vetches, particularly on the sandy and red soils, would have the effect of supplying humus, an element these

soils are much in need of. Nitrogen in the available form would be stored up at a greater rate, and phosphoric acid released in greater quantity than where the land is thrown out only. The cost of seed, cultivation, and manure would be less than 20s. per acre, and from the mixture, fat lambs, to the number of three to ten, according to the growth of the crop, could be turned off. Taking the value of the lambs at 12s., and the minimum number fattened at three per acre, this would leave a net balance of 16s. per acre. The land would be left in better condition to produce the next wheat crop, and would also be more friable and easily cultivated, which in the case of the red land especially would be a great advantage. Where such crops are grown as a rotation they should not be allowed to ripen, but should be fed green, and ploughed under in the late spring. Manure should be used to stimulate a better growth, and so help to bring about a further beneficial residual effect. Rape and peas are also useful rotation crops for wheat, and also the clovers where they can be successfully grown.

The extended use of water for irrigation would enable many new crops to be grown in the Wimmera in the shape of millets, sorghums, and clovers, which would enormously increase the carrying capacity of the land. Lucerne under irrigation would not only yield large returns, but if satisfactorily established would increase the value of the land suitable for its production from five to ten times its present estimate.

That better cultivation methods could be more universal is evidenced by the crops themselves, and in the annual returns obtained by certain farmers in good and bad seasons. The good farmer will get the better return simply owing to his improved practices, and for the sake of another stroke of the harrows or cultivator very often an extra 2 or 3 bushels per acre is lost, and it is the extra bushel that is all profit.

In seed selection there is a great future for improved yields. Graded seed in the tests at the different Research Farms shows a difference in the returns of 14s. per acre when comparing the best grade with the worst. How much more might be expected from carefully selected seed from the most prolific plants, true to type, and persevered with for several seasons. Small plots of 3, 5, or more acres used as stud plots each year from which the best seed was selected for the next year's stud plot, and the bulk sown on the main crop, would not entail much work, and would lead to increased production and bigger bank balances.

Where larger quantities of manure have been in use than the average, heavier crops have been harvested. There is a limit, under some circumstances, to the amount which gives the most profitable return and this will vary according to the quality of the soil operated upon.

Where the soil and water supply is capable of producing a 30-bushel crop per acre, the amount of nitrogen taken by such a crop is a little over 40 lbs. This special food can be obtained by early fallowing, and the growth of the rotation crops mentioned; and a continual supply can be taken from the atmosphere year after year in the same way. With respect to the next most important food, known as phosphoric acid the case is different; no supplies can be drawn from the air, and the whole requirement of the crop is taken from the existing fund in the soil. A 30-bushel crop takes over 20 lbs. of phosphoric acid for its development. When we apply 50 lbs. of super. we contribute just half the phosphoric acid required, and so must rely on the soil store for the balance, and if that is not there in the available form a 30-bushel crop is impossible.

Moreover, unless we put into the soil as much phosphoric acid as the crop removes, we are gradually making the soil poorer and poorer, rendering longer spells necessary, and ultimately running the soil right out. It must, therefore, be a good business proposition to use more super.; 1 cwt. per acre would be sufficient to enable the soil to give a full return for the labour, seed, &c., expended upon it in other directions. Further, where a full amount of phospohric acid is available, less moisture will be necessary to produce a crop, as all the food is taken up in solution, and the stronger the solution the less the quantity of water is transpired through the leaf system to provide nourishment. The soil's fertility would be maintained for future crops, and even if the land were allowed to return to grass, better food values in the fodder would obtain. When farmers generally realize that their yields are practically governed by the water, nitrogen, and phosphoric acid supply, and any deficiency in any one of those factors means smaller returns, one great step in the right principles of farming will have been mastered.

The results of the crop and fallow competitions are submitted with comments herewith:—

No. 1.—Nhill Crop Competition.

For best exhibited half of wheat crop not less than 75 acres.

Name.	Location.	Freedom from Weeds.	Disease.	Purity and Trueness to Type.	Eveness.	Apparent Yield.	Total.
Maximu	m points ..	15	15	20	15	35	100
G. Crouch ..	Kaniva ..	14	14	17	14	33	92
O. H. Lienert ..	Lorquon ..	13	13	18	14	32	90
Voigt and Sallman	Mt. Elgin ..	13	14	17	12	30	86
H. Scroope ..	Diapur ..	12	12	17	13	30	84
G. H. Voight ..	Winiam ..	13	12	17	12	30	83
R. Blackwood ..	Kiata East ..	12	14	14	11	30	81
F. W. Habey ..	Salisbury ..	11	13	16	11	30	81
W. Krelle ..	Woorak West	13	12	13	12	31	81
B. Schultz ..	Ni Ni Well ..	12	14	14	12	28	80
J. Collins ..	Woorak ..	13	13	13	11	30	77
J. Dart ..	Nhill ..	12	11	12	10	24	69

P. H. J. Goodwin retired from the competition, on the ground that his crop was not good enough.

No. 2.—Mallee Crop, 100 acres.

Name.	Location.	Freedom from Weeds.	Disease.	Purity and Trueness to Type.	Eveness.	Apparent Yield.	Total.
Maximu	m points ..	15	15	20	15	35	100
D. R. McKenzie ..	Glenlee ..	12	14	15	13	30	84
T. Miller ..	" ..	12	12	14	12	30	80

No. 3.—Fallowed Land, 100 acres.

Name.	Locality.	Moisture.	Freedom from Weeds.	Mulch.	Cultivation.	Total.
Maximu	m points ..	25	25	25	25	100
E. J. Hoffman ..	Winiam ..	24	23	24	24	95
P. Bone, junr. ..	Kiata East ..	22	22	24	24	92
G. Crouch ..	Kaniva ..	20	22	24	24	90
D. R. McKenzie ..	Glenlee ..	20	20	24	23	87
R. Blackwood ..	Kiata East ..	20	20	21	21	82
O. H. Lienert ..	Lorquon ..	17	20	20	20	77

No. 4.—Wheat Crop on 1915 Fallow.

Name.	Locality.	Moisture.	Freedom from Weeds.	Mulch.	Cultivation.	Total.
Maximu	m points ..	25	25	25	25	100
E. J. Hoffman ..	Winiam ..	24	23	24	24	95
P. Bone, junr. ..	Kiata East ..	22	22	24	24	92
G. Crouch ..	Kaniva ..	20	22	24	24	90
R. Blackwood ..	Kiata East ..	20	20	21	21	82

In the crop competition for best half of crop, Mr. G. Crouch, of Kaniva, comes first, a fine performance when the area, 700 acres, is taken into consideration. In addition to his fine crop of Federation wheat, Mr. Crouch has crops of Gluyas, College Eclipse, and Lots, every one of which is very good. The Gluyas, an early variety, popular in South Australia, and less liable to disease than most wheats, is a nice crop, very clean and pure, and showing a beautiful plump grain and colour. The ears are dark-bronze with a slight tip beard. It has, however, a weak straw, and the crop under review showed a tendency to go down, though not so badly that it could not all be taken off with the harvester. In dry seasons this should prove a valuable variety for the Wimmera. The crop of College Eclipse was also a fine one, growing however, rather too much straw inclined to be weak, the heads being well filled and compact.

The Lots wheat is a variety resembling Darts Imperial, being later in maturing, growing plenty of straw, and should be a useful hay wheat as well as a prolific grain yielder.

The Federation on this farm was exceptionally good and heavy, and the special features of all the crops seen on Mr. Crouch's farm were their evenness, purity, and freedom from disease. The all-round yield, too, should be extremely good. These results evidence careful management in cultivation, seed selection, and general treatment. Some very nice crops of oats and barley were also noticed.

Mr. O. H. Lienert, of Lorquon, is a good second with some fine crops, notably 100 acres of Yandilla King. This crop, though containin a few wild oats and small patches of takeall, was a particularly nice one, exceptionally well headed, and should yield a big result. His crop of Federation, however, was not equal to some others seen.

Messrs. Voigt and Sallman, of Mt. Elgin, showed a nice crop of Federation, on red ground, clean, and free from disease, with very few foreign heads. This crop should yield well, but was inclined to be thin in patches.

Mr. H. Scroope, though not securing a prize, showed some fine crops in his 600 acres exhibited, included in which were Federation, Purple Straw, Marshall's No. 3, and Zealand Blue. These crops were not as clean or even as the prize crops, but were nevertheless good.

Both Marshall's No. 3 and Zealand Blue are rather late varieties, and perhaps better suited to cooler districts; they are both good hay wheats, but would not be suited by dry seasons.

The task of judging the crops on this occasion was not easy, as, taken all round, there was not a very great difference in yields, as the points awarded indicate. But there was a considerable variation in respect to purity and evenness.

The crops generally were fairly free from disease, though patches of takeall, slight touches of rust, and a little smut were observable in various instances. Dead heads were not numerous, and wild oats not as plentiful as is generally the case, and most of the crops were clean in the bottom.

The best crops this year were grown on the black ground, which was evidently suited by the season, and it might be worth the attention of the Society in future as to whether a separate prize for crops on red and black ground be offered, as the different classes of soil are liable to place exhibitors in a somewhat inequitable position.

In summing up the points allotted, attention has been drawn to the fact that those farmers in the habit of using larger applications of manure are getting better crops than their neighbours.

The habit of harrowing crops after they have grown a few inches does not appear to be as general in this district as in some others. The red ground especially would respond to such treatment, particularly if the surface has set or caked, and the ravages of takeall be checked as a result, in addition to which moisture would be better conserved and the air more freely admitted to the roots of the crops.

The amount of seed used varied from 30 to 60 lbs. per acre; the best results apparently coming from applications of from 50 to 60 lbs.

The opinions of most of the oldest farmers were in favour of shallow sowing, and in this I think they are right, provided the land has been properly cultivated—2 inches to 2½ inches being the maximum depth at which seed should be deposited. The germinating seed likes warmth, moisture, light, and air for its prompt development.

The growth of oats in rotation without additional manure is not to be recommended; better filled oats and heavier yields of grain would compensate the grower, and the land be of greater value either for grass or succeeding crops.

The pickling of seed is still done haphazardly in the majority of cases, and consequent loss takes place, as the strength of the solution is generally too high, and a certain proportion of the seed germs is

destroyed. The right quantities are 1½ to 2 per cent., or in other words, 1½ to 2 lbs. of bluestone to 10 gallons of water. This is sufficiently strong to kill the spores of smut, and at the same time injure the grain as little as possible.

Mr. Crouch, of Kaniva, favours formalin, and his results are certainly encouraging. The strength used being one in 400, *i.e.*, 1 lb. in 400 lbs. of water.

Pickling with formalin requires more careful treatment than bluestone, as re-infection is more liable in smut-infested soil, or in seed in which the smut balls have not been removed.

In conclusion, I must take this opportunity of thanking Messrs. T. Walters, T. W. Durant, A. F. McGill, and John Young for their generosity in providing motors and drivers to facilitate the work, which with horses would easily have occupied twice the time employed. The usual Wimmera hospitality was enjoyed in all places visited, and a valuable interchange of ideas thoroughly appreciated by the judge. The Wimmera farmer takes a wide view of matters pertaining to farm pursuits, and he should be grateful to the fate that enables him to live in a part of the world where large aspirations are capable of fulfilment, and where the acutal extent of his operations and surroundings has a broadening influence.

The success of the Nhill competitions is undoubtedly due in great measure to the energy, perseverance, and excellent organization of the Society's evergreen secretary, who spares no time or trouble in his efforts to forward the interests of the district.

I am, Sir,
Yours faithfully,
Temple A. J. Smith,
Chief Field Officer.

Mallee Crop No. 2.

There were two entries only in this section, Mr. D. R. McKenzie securing first prize for a crop of Federation, even, thick, and clean. This crop had the foreign heads picked out, and was healthy. Mr. Miller's crop was also a good one, but contained some dead heads and slight patches of takeall; it was, nevertheless, well worthy of second prize.

Fallow Competition No. 3.

Mr. E. J. Hoffman scores a meritorious win in this section, his fallow being as nearly perfect as possible, with the exception of an odd weed or two. The moisture content was very fine, and cultivation even throughout, both the red and black soil getting consistent treatment. This was not the case in some of the other exhibits where the black soil was in good order, but the red patches had become consolidated, and were simply scratched over the surface by the implements used.

Mr. Peter Bone also showed a very nice fallow which ran Mr. Hoffman's closely, but was slightly inferior in moisture content, and carried a little more weed. It was nevertheless a fine exhibit.

Of the others, Mr. Crouch was next best, while the remaining exhibits in this class would have been better for further cultivation, and were not as uniform.

Fallow No. 4.

As would be expected, the same competitors take similar positions in this section, and it will be interesting to see next year how the effect of these fallows will affect the succeeding crops. On the whole, the fallow exhibits were good, and in this department of farming the Wimmera farmer is hard to beat.

Early fallowing means not only more moisture, but more available nitrogen, and the release of greater amounts of phosphoric acid and potash, a firmer and finer seed bed, and, given a normal season, bigger crops.

Working the land at the right moment has important effects in respect to fallowing, and with the red ground particularly, which if allowed to bake, is difficult to cultivate, this applies with much force. In fact, doing the right thing at the right time is one of the great secrets of farming generally.

In a natural state, animals live on green fodder; it is their natural food, and, as a consequence, they thrive on it. But when animals, as in present-day farming, have been domesticated, the case is a little different. Care requires to be exercised in changing the diet from dry to green food. It should not be done too suddenly. The green stuff should be fed in combination with old hay, the green fodder being gradually increased and the proportion of hay reduced.

Lucerne is one of the most nourishing animal foodstuffs, as is indicated by the analysis of the plant. When it is coming into bloom it contains the following percentages:—Albuminoids 18.47, fat 1.14, carbohydrates 64.04.

Provide plenty of clean, fresh water for the calves during hot weather. Those getting milk require water in addition to their other drink, and it is surprising what a quantity they will utilize.

Roughly speaking, the number of sheep estimated to be in existence at the present time is some 615,000,000. Of these, one-third at least are found within the confines of the British Empire. This fact at once shows the importance of the flock-owning industry to the welfare of our own Empire and country.

PLANTING AND RECONSTITUTION OF VINEYARDS.

CONDITIONS GOVERNING THE DISTRIBUTION OF PHYLLOXERA-RESISTANT VINE ROOTLINGS AND CUTTINGS.

During the past two seasons the conditions subject to which Victorian vine-growers may purchase phylloxera-resistant vine cuttings and rootlings, whether grafted or ungrafted, have been published in this *Journal* in full detail, so that growers should now be familiar with such conditions, which will again apply to the coming distributions (Ungrafted Rootlings and Cuttings, season 1916; and Grafted Rootlings, season 1917), the only alterations being the necessary correction of dates, viz., the substitution of the year 1916 for 1915, and of 1917 for 1916, respectively.

It will suffice here to explain that resistant vines are supplied to intending planters in any of the following forms, and at the prices stated, packing extra:—

Resistant rootlings, grafted with scions previously supplied by applicants, at per 1,000, £6.

Resistant rootlings, ungrafted, at per 1,000, £1 10s.

Resistant cuttings, at per 1,000, 15s.

Application Forms.

No application will be entertained unless made on the forms supplied for the purpose, which are obtainable from the Director, Department of Agriculture, Melbourne, or from the Principal, Viticultural College, Rutherglen.

Separate forms are provided for (*a*) Grafted Rootlings (blue form), (*b*) Ungrafted Rootlings and Cuttings (buff form). Applications must be filled in on the proper forms.

Each applicant for forms will be supplied with a copy of the detailed conditions governing the distribution of phylloxera-resistant vine rootlings and cuttings.

Applicants are earnestly requested to thoroughly familiarize themselves with them. *They are warned that under no circumstances can any departure be permitted from the regulations governing the distribution as detailed therein, nor can any request for special consideration be entertained.*

Dates before which Applications must be made.

For Grafted Rootlings (1917 distribution, June to August inclusive). Applications will be received until 31st May next. (For the 1916 distribution the time for receiving applications closed on 31st May, 1915, and present applicants cannot be supplied until 1917.)

For Ungrafted Rootlings and Cuttings, to be distributed from July to August inclusive, 1916, applications will be received until 30th June, 1916.

Supplying Clean Districts.

Rootlings and Cuttings cannot be sent from nurseries in phylloxerated districts to clean districts. A limited number of clean Ungrafted Rootlings are, however, available for distribution to clean districts. The price charged is £2 per 1,000, packing extra. Applications for these will be received by Mr. E. E. Pescott, Principal, School of Horticulture, Burnley, until 1st June, 1916.

HERD IMPROVEMENT.

Breeding for Butter Fat.

By R. A. Barr, Senior Dairy Supervisor.

Apart from the value of feed, the principal factor in breeding for butter fat is selection:—1st. When purchasing untested cows, select on dairy type. Dairy type is a term glibly used, yet difficult to define; it exemplifies a type which is the result of the development of the special purpose dairy cow. 2nd. Proving the earning capacity of the selected animals and all cows in herd by use of Babcock tester and scales. 3rd. Selection and use of a pure-bred dairy bull, whose immediate female ancestors have proved profitable butter-fat producers.

To the stock-breeder the maxim "like begets like" is delusive, insomuch as no two animals are exactly alike in all unit characters; and even if it were possible to breed from animals possessing exactly the same external characters as measured by the eye, we have no means of determining beforehand those characters which have passed to the animals from previous generations. Characters which, although not apparent in the parent, may appear in the offspring. The conformation of the bull does not assure the breeder that he will have profitable dairy cows even when used with a breed of good dairy cows. The character of milking capacity is not visible in the bull; but if his female ancestral line were profitable one may reasonably anticipate this quality to be transmitted to the heifers. In the practice of breeding it is not only necessary for the dam and sire to possess those qualities which are desired in the offspring, but it is equally important that such qualities should have been possessed by the immediate ancestors. Although the above maxim is misleading, breeding is not a matter of chance. The germ cells of the cow and bull contain bodies which determine the transmission of hereditary characters. These determiners act as a link between the conjugating male and female blood strains as well as between successive generations. For this reason frequently a calf is born differing greatly from the parents, but showing a marked resemblance to some remote ancestor.

The system to be practised in breeding dairy cows should lead to an accumulation of those characters which are associated with milk production. It is remarkable that no determined effort is made by dairy farmers to increase the earning of the herd from year to year. Where an effort is made the general practice is to cull by selection on type; but type does not cause a cow to be a profitable milker. It is the result of a continuous variation in response to the extraordinary development of the udder as a secretory organ. Dairy type is the result and not the cause of udder activity. Consequently it can be readily understood that cows may possess this type and yet be unprofitable. The type may be given by the cow, and the bull, being from a line of unprofitable milkers, may transmit poor milking quality to his stock. The capacity of a cow to secrete a heavy flow of milk or large amount of butter fat is not regulated by type. It is inherent, and according to its degree only is it proportional to the amount of food consumed. If the amount of butter fat were proportional to the amount of food consumed, all cows consuming the same amount of food would yield the

same amount of milk. If dairy type controlled the flow of milk, then all cows having the same type and consuming the same quantity of food would yield equal quantities of milk.

Under the influences of continual selection and feeding, the dairy cow has made a marked and rapid change, and differs widely from the original stock, and also from the purely beef breeds, both in type and function. The more noticeable chracteristics are—(*a*) the angular or wedge shaped conformation; (*b*) extreme development of the body by increasing its holding capacity. At best, the dairy cow can only convert the nutrients in her food into the nutrients of milk, and to yield a heavy flow of milk a large capacity for food is essential. For this reason light, weedy, and herring-gutted animals are never profitable; (*c*) a stimulated activity of the udder as a specialized secretory organ. All useful cows yield a greater amount of milk, and for a longer period than is required to rear a calf.

A recognition of these facts is useful when purchasing, because it provides a standard It does not guarantee that cows possessing these attributes will be profitable, but only that with proper treatment they may be so. It is interesting to note that in general these features are common to good milkers. These characteristics constitute dairy type; usually many other features, such as fine shoulders and withers, fine neck and tail, &c., are associated, and at times too much value is given to them. These are subsidiary and not essential features. When general health is manifest, attention need only be directed to those parts most intimately connected with milk secretion. Whilst a fine wither, lengthy clean switch, fine head, and general symmetry are pleasing to the eye, they do not influence the milk secretion. The outstanding characteristic of all heavy producers is the well-developed body. Nature usually maintains a certain correlation of parts, and as the body or "middle piece" of the dairy cow increases in response to the increased activity of the udder, the two ends strengthen to support the added strain resulting in a comparative coarseness, but the amount of milk is not affected, whilst robustness is obtained.

This is particularly noticeable in some of the finer strains of dairy cattle. The robustness and increased development of certain heavy milking families is an outstanding feature in the evolution of the special purpose dairy cow.

The foundation of a dairy herd should be good roomy cows without undue fleshiness. The heavy-fleshed cow costs more for maintenance than the lighter, conditioned animal. Surplus flesh means increased cost for maintenance without any additional return.

The present-day dairy type is the result of certain influences. Two methods which have greatly helped to this end are the use of the Babcock tester and the use of dairy bulls from milking strains. The continued application of these will not only maintain the present standard, but greatly improve it.

The leading factor in the recent development of the special purpose dairy cow was the introduction of the Babcock tester, which when used conjointly with the spring balance provides a ready and correct means of ascertaining the individual worth. It facilitated the process of selection and placed it on a safe monetary basis. It not only provides a means of estimating the value of the cow, but also that of the bull by recording the yield of his female ancestors, and then proving his worth by showing the returns of his heifers.

Having selected or being possessed of a herd, the value of each cow should be proved by weighing and testing the milk. It is not possible to state the earnings of a cow by inspection; no one can enter a yard and definitely state what each cow is earning. It does not follow that because a large amount of milk is given by a cow that she is the most profitable in the herd, nor does a high test indicate a high value. It is the amount of butter fat which counts. Where hand milking is practised the better method is to weigh after each milking, and make a record of such weight. This method is both instructive and interesting. It shows the effect upon the milk yield of any change in feed, and rapidly reveals whether any change or increase in feed produces an increase in milk sufficient to pay for the cost. The system of recording gives a definite value for milk production of any food, and raises it above conjecture or guess work. It eliminates from dairy practice the pernicious habit of "guess and trial." Likewise it is a sure index to sickness in the herd, because frequently in the incipient stages the decrease in yield is not so marked as to be observed by the casual milker. A working method, giving an approximate return, is to weigh one day each month; multiply this amount by the number of days in month, when the sum may be taken as the approximate monthly yield. The test should be made each month.

The object of record keeping is practical. It shows—

(1) Whether the cows keep the farm, or whether the farm keeps the cows.

(2) Which cows are paying for their feed and labour, and which are unprofitable. In every unculled herd there are cows which do not pay for their keep. They not only consume food from which no adequate return is received, but use food which, if given to other cows in the herd, would return a greater profit. The unprofitable take food from the profitable.

(3) From which cows heifer calves should be reared to increase the herd, or to replace the unprofitable. Many a good old cow is culled simply because she is old and replaced by a young duffer. Cows should be culled on their returns, and not on their years. This year (1915) a 16-year-old cow gave 471 lbs. butter fat in nine months, and last year in the same time gave 523 lbs. butter fat.

A second factor in the improvement of the dairy cow was the use of dairy bulls from proved milking strains.

The trite saying "the bull is half the herd" is less than half the truth. The bull either increases or decreases the milking qualities of his stock; in other words, the bull either makes the herd profitable or unprofitable. The bull is more important than the cow. Each cow can influence one calf each season. The bull may transmit his qualities, good or bad, to each of his calves. If under similar conditions the heifers are to be more profitable than their dams, the increased profit must come through the bull, consequently too much care cannot be given to his selection. Whilst dairy type as indicative of milking quality possesses some value in the cow, it is much less in the bull. It does not necessarily follow that because a bull presents a nice appearance, is deep in the flank, level on top line, lengthy between hip and

pin, fine over wither, good escutcheon, and rudimentary teats, and other fancied points which please the eye that he is a fit dairy sire. The essential qualifications of a dairy bull are purity of blood, masculinity, and an authentic record of being descended from females on both dam's and sire's side which have proved themselves profitable producers. These attributes are inter-dependent, and any two without the third renders the whole valueless.

Purity of blood denotes that the animal possesses the blood strains of his particular breed, and when used with cross-bred cows will be more prepotent than a cross-bred bull in which many strains commingle. The pedigree of a bull is more valuable if the families represented are few than if at every union a new family is introduced, because all families possess characteristics peculiar to each, and the continual commingling of these is less effective than if by a gradual accumulation the characters of a few families are centred in the bull. Masculinity with which is associated sexual vigour and general health is a quality quickly recognised but difficult to define. It may be described as a bold, fearless sort of expression.

As dairy cows are bred and fed for milk production no bull is a fit dairy sire unless his female ancestors established their worth as dairy cows. Purity of pedigree and a typical appearance alone do not assure that the bull will get good heifers. The use of a pure-bred bull leads to uniformity in the heifer, while the cross-bred bull leads to inconsistency and mongrelism. It is not reasonable to expect a cheap cross-bred bull, perhaps out of a cow whose milk yield was not sufficient to rear her calf, to show a marked and continual improvement in the heifers. It was for the purpose of supplying dairy farmers with reliable knowledge for purchasing bulls of milking strain that the Department of Agriculture instituted the Standard Herd Test, whereby pure-bred cows, accepted by the various herd books and not ostensibly pure-bred by doubtful pedigrees, are tested each year over a period of nine months. The benefit of this scheme is to show farmers from which cows bulls may be purchased. The average butter fat yield of the average cow is about 160 lbs. during normal years. Last year 165 pure-bred cows averaged 319 lbs. butter fat, and 104 2-year-old heifers averaged 211 lbs. From this it will be readily inferred that the use of bulls from some of these cows would effect a decided increase. Not only are the records of the dams available, but in some cases those of the grand dams on both dam's and sire's side. Such records illustrate how in some families milking capacity is transmitted.

The prices of such bulls are greater than the cross-bred of unknown quality, but it is unreasonable to expect something good at a cheap price. Quality demands its price, and is generally worth it.

Having placed such a bull in the herd, keep him in a small yard, and do not allow him to waste his energies by undue service, such as occurs when running with cows in the paddock. Many make the error of keeping the bull only to get the cows in calf; his use should also be to increase the value of his stock. If a bull is supposed to possess quality he should never be disposed of until his value as a dairy sire is proved by his heifers. Many a good bull has been sold before his value was known. If the heifers are more profitable under similar conditions than their dams, keep the bulls as long as possible if only to serve the older cows, and when necessary to introduce another bull buy one

of the same family as the former, which has already proved profitable. By this method the good qualities transmitted by the first are increased by the second sire. Crossing strains is only a little better than crossing breeds. When it is impossible to keep two bulls the first may be loaned or sold on condition that his services are available when required. When two bulls are kept the first can be used on the heifers by the second, and the practice repeated. So long as the mating animals are robust no harm will result.

WHAT IS EFFICIENCY ?

At the present time a great efficiency movement is sweeping the industries. The attention of employers in general is directed toward that one goal as to how to produce the maximum production at the minimum expense. The term speed, or speeding-up, has become a by-word, coined by the so-called efficiency experts, many of whom have been drafted from the rank and file of impractical men. Asked to investigate factory conditions, they file a report with the employers who have been induced to employ them, making a recommendation that in their judgment the only way to increase their output without additional expense is to drive their men, speed them up, make a machine out of them, and when worked out replace them. There is nothing scientific in such a recommendation. Every successful scientific invention of the past has had a *tendency to reduce the physical labours, and to encourage the individual* to think and work with his head rather than with his hands. It is not the aim of scientific management to induce men to act as nearly like a machine as possible. True, a foreman will prove his efficiency by th measured quality and quantity of his output, but it must come through systematic planning and education of the individual. Men must be led, not driven. Instead of working unwillingly for their employer, they must work in co-operation with the management. Mistakes, instead of having to be corrected, must be avoided. So the first thing that must interest is the careful selection of the man that is going to have full charge of any given department. He must first of all be an expert in his line of work. Nothing is so detrimental as to have a man fall into a position by luck, without having the necessary qualification. A foreman must be looked up to by the men under him, as one that has had a little more experience than they have had, for it will not take long for the men to find out if such is not the case, and when they do, he will not be able to exercise the proper control over them, and will eventually destroy the efficiency of his department.

The greatest efficiency can be obtained only when the men are happy satisfied, and contented with their surroundings. Since it is hard to find any two men that will do the same amount of work in a given time, discretion must be exercised by the foreman in the placing of his men where they can be used to the best advantage, with his work always planned in advance, so that they know they always have a job ahead of them.

—Richard M. Van Gaasbeek, in *American Industries.*

THE PROFIT THAT ARISES FROM DIPPING SHEEP.

The intention of this article is to draw the attention of owners of large and small flocks to the profit to be derived from dipping sheep, irrespective as to their being tick and lice infested, and to the most practical and easiest way of going about it. Some owners object on account of expense, and many more because they don't like work, and others, again, have no liking for sheep beyond the £ s. d. part, and some take to sheep raising with insufficient knowledge of the art of profitable sheep farming.

It would be a good demonstration to exhibit at some of our pastoral shows, say, 50 sheep of the one age, breed, and sex, reared under exactly similar conditions—25 dipped and 25 undipped. A lesser number would do, provided that each lot got the same treatment from start to finish. Let them be weighed before dipping, and also the controls, and at the exhibition let both lots be weighed, say, not less than eight months or so after treatment. From experience I can safely say it would be an eye-opener to the uninitiated, and I will detail as near as I can an experiment of my own:—Fifty two-tooth sheep (cross-breds) were selected out of one flock, all born at the one lambing. These when shorn cut nearly equal weights of wool. Six weeks after shearing they were all weighed, and 25 were dipped and 25 were not dipped. They were all clean sheep, and were then turned out together, and received exactly the same treatment as regards food (natural pasture only) and other attentions right up to the next shearing, when they were shorn and again weighed. The result was the dipped sheep cut 1½ lbs. more wool and had gained 5 lbs. more meat than the undipped ones. These were all wethers, and the season was an average one. Another year, one of semi-drought, another experiment was tried, with the same result, as far as increases in wool and mutton are concerned, but not to the same extent. The increase in the second experiment was ¾ lb. of wool and 3 lbs. of mutton. The wool was tender in both lots, but was more bulky in the dipped. Now, to show that it pays to dip, we will take an owner of 1,500 sheep, as that is getting near what most flocks will number in the very near future. First we will take the cost of putting down a dip, say, £40, though that is outside what it would cost, as in most districts, if the sheepyards are properly built, the swims and draining pens can be made to fit in. Now to total up:—Dip, £40; yards, £20; dipping 1,500 sheep, at ½d. per head, £6 5s.; three men's wages, at 1s. per hour (three hours), 9s.; makes £66 14s., including everything. Now, on the credit side we find increased weight of wool at 1½ lbs. per sheep, at 8d. per lb., £75; increased growth of meat, 5 lbs., at 6d. per lb., present price, on 1,500 sheep, £187 10s.; total, £262 10s. Deducting cost of dipping and appliances, £66 14s., leaves £195 16s., or about 2s. 7¼d. per head profit. After the first year the profit is greater, as we only have to allow about 10 per cent. for depreciation, &c.; but there is still another tangible gain, and that is in the selling value, easily 1s. per head, because dipped sheep are more presentable to the buyer. The increase in mutton only takes place during the sheep's

maturing years, say, from lambhood to about 6-tooth off. Aged sheep keep in better condition both in flesh and wool. At 4 years old the wool growth has reached its "pivotal point," and begins to decline, but during the growing period of the sheep there is a large margin of profit in dipping properly. There is a right and a wrong way to do all things. I don't intend the figures given to be absolutely correct, as the profit would vary in different districts; but, no matter where or when, there is a good profit. What I want to show is that as a business transaction dipping pays handsomely. I know one man who usually dealt in crossbred weaners off shears, and as soon as they arrived on his holding they were thoroughly dipped, not for vermin, as they were perfectly clean in this respect, but to free them from all troubles as much as possible, so that all they had to do was to eat and grow. That man always sold at large profits, and his sheep always took the buyer's eye.

Many years ago in a dry time I had to shepherd a flock of sheep, and as usual under these circumstances, one becomes a philosopher, being alone from daylight to dark. Now, that flock was thickly infested with ticks, and in order to occupy my mind I used to see how much feeding time the sheep lost nibbling and scratching, and I found that certain sheep that I knew well by their countenances lost from three to four hours each day from rest and feed by having to rub and scratch themselves to allay the irritation set up by the ticks biting. Now, I came to the safe conclusion during the two months I had charge of that flock, that they were diverted from increasing their productive value, such as growing wool and carcass, for fifteen days. That would be roughly 2 ozs. of wool and about $\frac{1}{4}$ lb. of flesh, fat, and bone. The owner of, say, 1,500, loses 2s. per head in the young sheep; that amounts to £150, and he is like unto the man in Scripture who only received two talents.

Dipping with a good dip tightens up the tip of the wool, thus preventing dust and rain penetrating too far down the fibre.

Many owners of sheep not vermin-infested look upon the dipping as unnecessary and non-paying; but I know that it is a profitable investment, is also a disinfectant, and a deterrent of the fly. It does not entirely prevent flyblows, but it goes a very long way towards doing so. If the sheep are well-crutched as well, there will be only a small percentage attacked.

I prefer a dip that has sulphur in the make-up, because the sulphur hangs on better than carbolised dips, which are more volatile, and in our dry, hot country the deterrent effect evaporates.

Of course, there is an art in dipping sheep, which is soon learned by use and observation. For instance, keep the dip up to a uniform strength and also keep it well stirred, so as not to waste the stuff, and also see that all sheep get a proper soaking, especially under the jaws, as it is here that tick-eggs find a secure lodgment. Some owners are extremely careless, and they blame the dip if the results are not what they expect. But dipping returns a good profit all the same.

Many owners credit dipping with only an increase in wool at a quarter of a pound, but this is too little. From three-quarters to over a

pound is about the increase, according to the season. I have proved this by actual weighing. A dip in itself does not directly influence a better growth, but it does indirectly by promoting a healthy skin, and by freeing the animal from annoyances that have a debilitating effect. It won't make wool grow where it is deficient on a sheep, but it will make the woolly parts grow more wool than on a similar sheep undipped, and this extra growth of carcass and wool leaves a profit sufficiently large to compensate the owner for all the extra work undertaken. Small owners of from 100 to 200 sheep do not want so large a plant; for these numbers dips can be built to suit their requirements very cheaply, and if it is done on co-operative lines, like shearing, one individual would not feel the cost, which should not exceed, after the dip is constructed, 10s., and the profit would be £3 to £4 in money value. that is for very small lots above-mentioned, where they have to be driven 4 or 5 miles. Spraying the dip on to the sheep is not effective in ridding it of vermin, because you cannot get it into all the crevices, as it were, and the sheep have to be up-ended to get at the belly parts. The swim is the only effective way, the sheep being entirely immersed at least once during the swim. The swim does not require to be longer than about 20 feet, provided the sheep are allowed to remain in the right time, and if the right medium is used at the right strength. It is the dip that tells. It is always as well to test the strength by using it on two or three sheep before the general dipping takes place. Seven to eight hundred sheep an hour is fair work.

"Crowfoot."—*The Pastoral Review*, November, 1915.

ENSILAGE—ITS VALUE AND COST OF PRODUCTION.

By R. R. Kerr, Dairy Supervisor, Research Farm, Werribee.

In successful dairy practice, from a productive and economic standpoint, the feeding of the dairy cattle is the farmer's chief concern, and it needs very little experience to convince any intelligent farmer that any lack of attention or thought on this important subject will soon be shown by a decreasing yield of the cows and a falling off in condition. Again, experience proves that one must expect a small yield the succeeding lactation period.

For any certainty of profitable result these feeding operations must be planned many months in advance, because no man has any certain idea of what Providence holds in store in the shape of rainless periods, floods, pests, and unforeseen contingencies. These hard times are experienced in all countries, and are apparently a reminder against carelessness, and perhaps necessary for the proper working of the universe. In the present season abundant crops and pastures abound in the many districts of the State, and it behoves us to make the best use of our opportunity and make provision for the lean times that surely come every few years.

One of the cheapest methods of conserving any green fodder is to convert it into silage, as, if properly made, it means having succulent fodder at all times, and a more healthy animal as a result of its feeding in the dry months. An all too common excuse for not making silage is —too costly—too much work; both erroneous expressions in practice, as it is, practically speaking, the cheapest feed in a bulky form that one can obtain.

The work of filling seems to prey on the minds of many men, all forgetful of the fact that to obtain a similar result would entail the continual growing and cutting of green crops in all weathers and every day in the year.

In the case of the farmer, what is meant for caution, so often proves quite the reverse, and is actually extravagance, seeing that it costs him in the long run more than he can afford to lose. That the hesitation so common amongst farmers to incur even highly remunerative expenditure can be departed from, was shown recently, when herds had to be replaced. But, unfortunately, it was to meet misfortune rather than future needs. One farmer expressed an opinion current among many of them. He said that "For farmers to incur the outlay is all very fine for Government experts to talk glibly about. Building a silo and making silage costs money and means a lot of work." Farmers holding just such opinions came before the various Boards, which sat to consider applications for cattle advances, &c. Most of them assured the Board that they could easily meet an advance of £250 if the Government would only advance the sum. When the herd was intact they would not lay out the small sum in a silo which would have saved their cows, but they were quite prepared to incur a new liability of perhaps five times the sum, and depend on a new untried herd, not yet acquired to meet it.

The past drought accounted for the death of many of our cattle, and the good crops and pastures this year, with the scarcity of cattle, must result in a low price for hay, and it is hoped that more use will be made of the silo. Silage will keep indefinitely, and does not suffer from vermin. Pastures have a very low feeding value after being continually bleached by the elements, and when rain comes after a dry spell, they rot and blow away.

The future prosperity of our dairying industry depends on the economic production of our milk and butter. Many of our old ideas must be thrown into the melting pot, and force of circumstances demands constant progress. With that in the foreground, our needs will force more attention to the production of silage. We all admire the progressive business methods of the American farmers, and their success is greatly due to the use they make of the silo—many thousands are in continual use; in fact, no farm is deemed complete without one. The object of this article is not so much concerned with the making of silage, but to give a concrete example of the great benefit derived from it by a farmer in the Boisdale district.

Mr. Trevor Harvey has a farm on the closer settlement portion of the Boisdale Estate, and owing to the uncertainty of the seasons, he decided to erect a silo, under the conditions offered by the Department of Agriculture.

If all the dairymen of the State were imbued with the same spirit of intelligent enterprise, failures would be few. Mr. Harvey is proving that success is assured where sound business methods prevail, and in his own words states that any dairyman who fails to make use of silage is ignorant of the best methods of farming practice. He could not correctly estimate its value to him during the past year, as the cows milked well during the drought, and he gained the high prices ruling for milk and butter during the winter months, and through the silo he was in a position to sell £200 worth of chaff. He kept his herd intact and sold £100 worth of cattle. Incidentally I may mention that Mr. Harvey is establishing a pure Jersey stud, which he has entered in the Government Pure Herd Testing scheme, and, judging by his adoption of sound methods and the enthusiasm he displays, his success is certain. The silo is of 70 tons capacity, of the wood and iron pattern. The crop harvested was maize, which did not cob, owing to the very hot winds at flowering time, and was dying off when it became necessary to cut it and commence filling the silo. There was very little waste, as it was good right up to the iron—except at the joints. Any waste was spread on the ground for the dry cattle, where it was cleaned up. The silage was sweet, of very appetising smell, and with good colour and appearance. The cows were given 30 lbs. each daily, with a little bran.

Cost of Production.

The land occupied by the maize (9 acres) was previously sown with oats for hay, which was a failure owing to the dry season. After the rains the land was at once ploughed, and the maize sown about the 20th December, the cutting was commenced on the 25th March, the maize occupying the land for three months, and immediately after removal the land was ploughed and sown with oats for grazing purposes.

Mr. Harvey supplies the following figures as the cost of production and other charges.

	£	s.	d.
9 acres of land, at £26 per acre, for three months, at 5 per cent.	2	18	6
9 acres, ploughing, at 8s. per acre	3	12	0
9 acres, two strokes of harrow, at 1s. per acre ..	0	18	0
9 acres, rolling, at 1s. 6d. per acre . ..	0	13	6
9 acres, sowing, at 2s. 6d. per acre . ..	1	2	6
2 bushels of seed, at 5s. per bushel	0	10	0
3 times cultivation, at 3s. 6d. per acre	4	14	6
Harvesting, carting, and filling silo, labour, cutter, and engine hired	11	11	6
Total	£26	0	6

Thus we see that the approximate cost of the silage was 7s. 6d. per ton, and this includes 3s. 4d. per ton for harvesting, carting, and filling.

The acreage of land under fallow in 1898 was 399,535 acres. This increased to 1,738,572 acres in 1914, but showed a decrease of approximately 400,000 acres in 1915.—*Victorian Year-Book* 1914-15.

Last year in Victoria the number of farmers who used artificial manure was 31,871, as compared with 21,586 in 1905, and 7,318 in 1898.

The area on which artificial manure was used represented only 7 per cent. of that under crop in 1898, but since then the proportion manured has rapidly increased. In 1901 it was 19 per cent.; in 1903, 36 per cent.; in 1905, 56 per cent.; in 1909, 66 per cent.; in 1911-12, 74 per cent.; in 1913, 77 per cent.; and in 1914, 81 per cent.

Only 19 acres in every 100 under crop in 1901 was treated with artificial fertilizer, but last year the acreage fertilized was 81 acres in every 100 cropped.

The number of tons of artificial fertilizer, at least 85 per cent. of which would be superphosphate, used in Victoria in 1901 was 23,526 tons against 117,935 tons in 1914—truly a remarkable increase over the short period of thirteen years.

The average dressing per acre in 1901 was approximately 94 lbs. against 70 lbs. in 1914.

Approximately 25 per cent. of the fertilizer used was imported, the remainder being the product of Victorian industry.—*Victorian Year-Book*, 1914-15.

Paint for Outbuildings.—A correspondent asks for a recipe for a cheap, durable paint for outbuildings. Mr. D. Oliver, Foreman Painter, Public Works Department, Wellington, to whom the matter was referred, states that if the colour does not matter the following is about as cheap and durable a paint as it is possible to make up:—To 5 gallons of boiled oil add 1 cwt. oxide of iron; let soak twenty-four hours; add 15 lbs. patent driers and 2 gallons kerosene, and mix well together. The colour of this paint is dull red.—*Journal of Agriculture, New Zealand.*

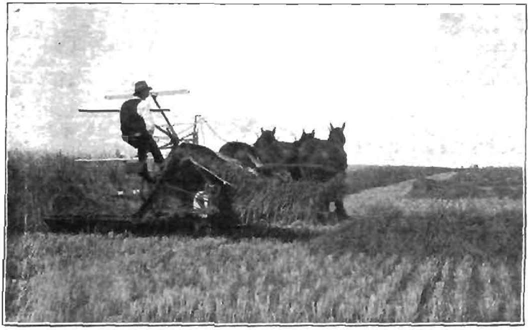
FARMERS' FIELD DAY.

WYUNA STATE FARM.

Abridged from the "Kyabram Free Press."

About 100 farmers and visitors assembled at the State Farm, Wyuna, on Friday, 26th November, when a farmers' field day was held. Mr. A. E. V. Richardson, Agricultural Superintendent, with Mr. Baird, the farm manager, conducted the visitors in a tour of inspection of the crops, stock, poultry, and experimental plots.

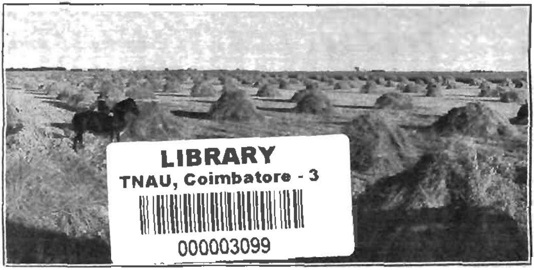
At the outset Mr. Richardson addressed the gathering in the implement shed, and read apologies from the Minister for Agriculture, Mr. Hagelthorn, Mr. H. McKenzie, Minister of Railways, and the Director of Agriculture, Dr. Cameron, all of whom were unavoidably prevented from attending owing to an important meeting of the State Wheat Marketing Committee.



Cutting Crop for Silage, Wyuna State Farm.

Mr. Richardson, in welcoming the farmers, said they had to congratulate themselves on the prospects for the coming harvest, which were a pleasant contrast to the drought conditions of last year, which had not been worse in Southern Australia within living memory. Reliable authorities estimated that 25,000,000 sheep and 2,500,000 cattle, with thousands of valuable horses, had perished as a result of the drought. The terrible experience of last year made many farmers vow that they would not be caught napping again, but they would lay by stores of fodder in good seasons, when there was a surplus, and hence large stacks of hay were accumulating on every farm. Many farmers, owing to scarcity of stock and abundance of feed were ensiling quantities of green feed, both in overground and underground pits, and even in

roughly prepared excavations. Such provident activity was to be commended, and the farmers would be rewarded in the first dry season they experienced. On the Wyuna farm the germ of prudential activity was abroad, and already 270 tons of chaffed ensilage had been made, 220 tons of hay cut, and the wheat and oat crop which would be thrashed would yield over 200 tons of straw—and this apart from the hay from the lucerne area. Besides drawing attention to the necessity for building up hay reserves, the drought had also led the community to conserve its water resources. At Sugarloaf operations had already commenced, and the reservoir being constructed there would have a storage capacity of 330,000 acre-feet of water. Waranga Basin was being extended to impound 320,000 acre feet, and in addition other storages were contemplated under the Murray Waters Agreement, and it was anticipated that eventually there would be more than enough water to irrigate 700,000 acres of land in these Northern districts. Finally, the drought caused an almost total failure of the crop last year, but the Government, in spite of the many difficulties confronting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View of Oaten Hay Crop, Wyuna State Farm.

the farmer, appealed to wheat-growers to sow a record acreage this year in view of the likelihood of a good season after the drought and the certainty of good prices for wheat in the markets of the world. The farmers responded magnificently in spite of the shortage of feed, and scarcity of seed wheat and the losses of farm stock. They were aided by an advance of £600,000 made by the Government, and as a result 4,100,000 acres of wheat had been sown, *i.e.*, 35 per cent. more wheat than the highest previous records. Very favorable conditions for wheat had prevailed this season, and it was anticipated that Australia's total crop would exceed 150,000,000 bushels, thus giving a surplus of 120,000,000 bushels, double the amount available for export in an ordinary year. At the same time it was extremely difficult to secure freight owing to the total disappearance of the German mercantile marine from the high seas, and the commandeering of British ships for the transport of men, munitions, and foodstuffs.

Mr. Richardson reviewed the work done in the field and poultry yards, and subsequently visitors inspected the farm.

He said that this year 280 acres had been sown with cereals, including 120 acres of wheat, 80 acres of hay, 40 acres of silage mixture, 35 acres of barley, 5 acres of rye for grain. The 40 acres cut for ensilage gave 270 tons of green stuff. All this had been chaffed into three overground silos, and was intended for winter feeding of the dairy stock. Three different methods of covering the silage were being tried, and the relative efficiency of these methods in preventing waste should prove of interest.

The wheat plots comprised manurial tests, rate of seeding, early and late sowing tests, and variety wheat trials. Fifteen different manurial tests were being conducted with varying combinations of manures. Some plots were unmanured; some had been dressed with phosphatic manures applied in different forms, and at varying rates per acre, while some of the plots were limed, and others treated with nitrogenous and potassic manures. The comparative merits of each system

View of Poultry Pens, Wyuna State Farm.

of manuring would be shown on harvesting, and would indicate the needs of plain land with regard to artificial manures.

Referring to the poultry section, the development of which was a feature of the farm, Mr. Richardson stated the Department was endeavouring to provide a good supply of high class egg-laying strains of White Leghorn. There were at present 1,300 pedigreed Leghorns, all bred from prize winners at the Government egg-laying competition. Orders for eggs had been received from every State in the Commonwealth during the past year. The world's record for egg-laying had been established last year at Burnley, when six hens, the progeny of a setting of eggs from Wyuna had laid 1,699 eggs. The cardinal principles in poultry-keeping were breeding, feeding, and weeding. Keep only good laying strains, feed them liberally and well, and cull out severely the inferior birds.

An inspection of the poultry yards and plant was made under the guidance of Mr. W. C. Rugg, the poultry manager. One of the first

features observed was a system of trap nests, installed for the purpose of detecting the best layers in a pen, and to demonstrate the different cycles in egg-laying peculiar to particular hens. Poor layers are discovered and cast out, and this method corresponded to a system of herd testing employed in a dairy herd. Some pens of fine pedigreed birds were on view, including many from this season's batch. The gathering had an opportunity of comparing the pen system with the flock system. This latter system is coming into vogue. The many devices used in feeding, watering, &c., showed how a large flock may be managed with an economy of labour. Mr. Rugg stated that in his opinion a settler could, with the flock system, look after 500 birds, and do his ordinary work of dairying besides, and if he confined himself to poultry farming he could handle 2,000 birds a year. The incubator room and brooder house were examined, and proved of considerable interest.

Leaving the poultry yards, the visitors were shown small areas of lucerne and artificial pastures, which had been sown for green feed.

Breeding Pens, Wyuna State Farm.

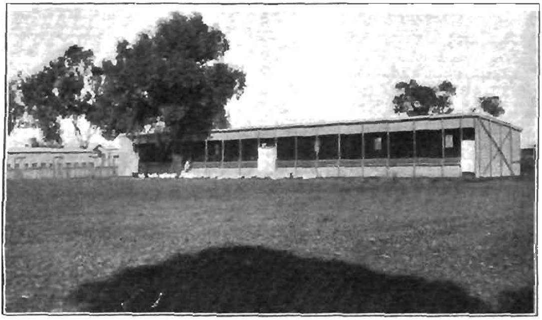
An enclosure of movable hurdles enables Mr. Rugg to hut a flock of young chickens on different parts of the areas.

The next feature of interest was the pasture top-dressing experiment. This series consisted of four ½-acre plots which had been treated with super. alone, with super. and lime, and with basic slag, while one plot was left untreated as a check plot. Although the land had been given no special treatment besides the top-dressing, the response to the fertilizer was most apparent, and the remarkable feature was the different character of the pasture on the four plots. The two plots which have been treated with lime and basic slag respectively showed a dense growth of trefoil and clover. It was stated that when stock were allowed to graze on the area they showed a preference for the pasture on the treated plots. The improvement effected caused great comment.

The manuarial tests on wheat were of interest. There seemed to be an increased growth corresponding to the amount of super. applied, but the efficiency of basic slag and bonedust as phosphatic manures was

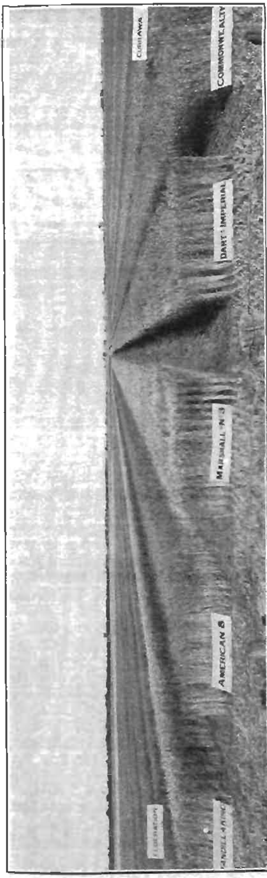
not so marked. *One plot was treated with sulphate of potash in addition* to super., and another with sulphates of ammonia and potash as well. No marked difference could be noticed between these plots, and an adjoining one to which super. alone had been applied. In a season like this the nitrifying organisms in the soil are very vigorous, partilarly in well-worked fallows, and nitrogenous manures have little effect on the crop. Liming did not appear to have influenced the grain yield, but it promoted a dense growth of straw. No conclusive evidence of the relative value of these different manures will be available till these plots are harvested.

In the variety wheat trials a number of different wheat were growing side by side to compare their progress under our conditions. They included Federation, Yandilla King, Marshall's, Dart's, Imperial, Commonwealth, Currawa, Bayah, Penny, Gluyas, King's Early, College Eclipse, American 8. All these wheat looked well, Penny being prominent.

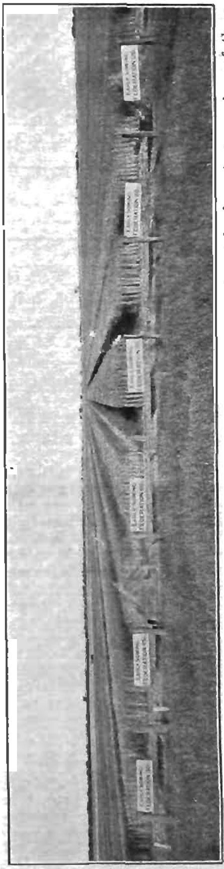


View of Brooder House and Laying Shed (Open Shed System), Wynna State Farm.

This wheat, it was stated, has given good results in departmental trials. It has a nice head, with plump grain, Other varieties attracting attention were Currawa and Dart's Imperial, and these looked very well in the bulk plots also. This latter wheat shows a fine growth of straw, with well filled heads. Other bulk plots included Commonwealth, Yandilla King, and there was to be seen a particularly fine bulk crop of Federation, very level and uniform, and free from foreign heads. Two varieties pointed out as suitable for late sowing were Gluyas and King's Early, which are early maturing wheats, grown in large quantities in South Australia and the Victorian Mallee. The rate of seeding and early and late sowing tests occupied twelve plots. All had similar amounts of manure, but six were sown at the end of April, and six in the middle of June, at the rates of 30, 45, 60, 75, 90, and 120 lbs. per acre. The amount of grain harvested from each plot will be an index to the most profitable rate of sowing. One



View of Experimental Wheat Plots, showing rate of seeding and time of sowing trials, Wyuna State Farm.



View of Selected Seed Plots, Wyuna State Farm. The plots are sown from selected heads, and the produce of these plots are sown in "variety" and "bulk" plots, to provide seed for distribution amongst farmers.

of the facts, which was clear, was that for later sowing it is advisable to increase the rate of seeding, as late sown wheat does not tiller so well.

The wheat, barley, and rye crops are being cut for thrashing. Cape barley has done exceedingly well this season, and 35 acres of barley was to be seen stacked. Mr. Baird, Farm Manager, estimates a return of over 40 bushels to the acre.

The draught mares with their foals were inspected, and later the dairy herd. Most of these are pure bred Jerseys, those at present being milked are of high quality.

View of Bulk Wheat Plots, Wyuna State Farm.

Fifteen acres of new lucerne had been sown on subsoiled land. Tamworth lucerne was sown with a mixture of basic slag, $\frac{3}{4}$ cwt., and superphosphate $\frac{3}{4}$ cwt. per acre. The effect of the subsoiling will be interesting. Experimental plots of summer crops, including ten varieties of maize, five of millet, and five sorghums are being grown to test whether they are suitable for local conditions. Lucerne manurial tests are also being conducted, including liming, treatment with basic slag, gypsum, &c. Great credit is due to Mr. Baird for the uniformly heavy returns obtained this year.

A NEW VARIETY OF HOPS.

"The Foundling."—This describes a new variety of hops found at Wye College. It has been thoroughly tested since 1908, and is noted as having good cropping qualities, high resin content, marked resistance to, if not total immunity from, the "nettle-head" disease; and lateness of season.

—E. S. Salmon, *Journal, Board of Agriculture (London)*, 1915.

POTATO EXPERIMENTAL FIELDS, 1915-16.

By J. T. Ramsay, Potato Expert.

Experiments in the cultivation of potatoes are being continued this season at Leongatha, Koo-wee-rup, and Portland. The areas on which the work is being carried on were chosen, firstly, because the soils were suited to potato production; and, secondly, because they are typical of large areas of land within the State, so that the results obtained will be widely applicable.

The accompanying plans show the details of the experiments and demonstrations.

LEONGATHA.

At Leongatha 5½ acres in all have been planted, which have been divided into sections as follows:—Section 1 is designed to test the effectiveness of eleven different manurial treatments, ranging from a moderate dressing of 3 cwt. of superphosphate per acre to 15 cwt. per acre of a compound, comprised of phosphatic, potassic, and nitrogenous manures, in order that the most profitable mixture and rate per acre may be determined. On this section thus treated, manurially, there have been planted ripe and immature seed of three different varieties suited to the district, namely, Factors, Sutton's Abundance, and Up-to-Date. All of these did fairly well in the district last year in spite of the dry season.

Section 2 is given to testing the efficiency as a preventive of disease of the use of dipping and spraying solutions. The portions of this section are seeded with potatoes which were (*a*) dipped straight away when dug last April; (*b*) dipped in November, just before planting; and (*c*) not treated with dipping solution. Fractions of each of these will be sprayed during the growing period, so that at the end of the season the results obtainable will range from seed which was absolutely untreated, as far as disease prevention is concerned, to that which was dipped only, sprayed only, and thence to plots which were as fully guarded from disease as is practicable by dipping and spraying treatments. The dipping solution used was made from corrosive sublimate at the rate of 1 oz. to 6 gallons of water, and seed treated with this solution was immersed for two hours, and then thoroughly drained and dried before planting. Spraying during the season will be done with a solution of copper and soda mixed in the proportions of 2 lbs. copper sulphate and 2½ lbs. washing soda to 10 gallons of water.

Section 3 is devoted to testing the best depth at which to plant sets, a question which is the cause of much argument at the present time amongst growers, because of the differences of opinion held on the matter. On this section the tubers have been uniformly spaced in the rows at 18 inches apart, while the depths at which tests are being made are 3 inches, 4 inches, 5 inches, 6 inches, 7 inches, and 8 inches.

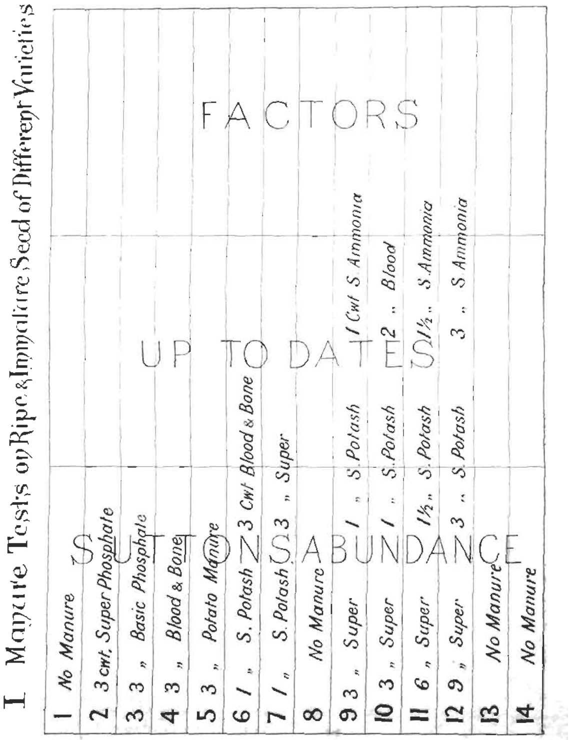
Section 4 is carried out to determine the most economical spacing at which tubers should be set, and planting has been done at 12 inches, 15 inches, 18 inches, and 21 inches, while the depth of planting has been kept uniformly at 4½ inches.

Section 5 will give a demonstration of the value of immature seed, as compared with ripe seed, and is one of the most important sections, if any distinction can be justly made. Six varieties are being used, these being Sutton's, Factors, Carman, Early Norther, Black Prince,

POTATO EXPERIMENTAL PLOTS

LABOR COLONY

LEONGATHA



POTATO EXPERIMENTAL PLOTS
LABOR COLONY
LEONGATHA

Plot	Test	Particulars
II	Dipping & Spraying Test	Up To Dates Dipped at Planting Time
		" " " " " " " & Sprayed
		" " " " " Digging Time
		" " " " " " " & Sprayed
		Up To Dates Not Dipped Nor Sprayed
III	Depth of Planting Test	Up To Dates Planted 3 inches deep 18 in apart
		" " " " 4 " " " "
		" " " " 5 " " " "
		" " " " 6 " " " "
		" " " " 7 " " " "
		" " " " 8 " " " "
IV	Spacing Test	Up To Dates Planted 4½ inches deep 12 inches apart
		" " " " " " " 15 " "
		" " " " " " " 18 " "
		" " " " " " " 21 " "
V	Immature V Ripe Seed	Suttons Factors Up To Dates Carmen Early Norther Black Prince
VI	Varieties	Carmen I Beauty of Hebron Suttons Abundance Factors Up to Dates Black Prince Early Norther Gold Coin White Elephant Coronation May Queen Ninetyfold Vermont Queen of the Valley Peach Bloom Scottish Triumph Eiffel Windsor Castle Green Mountain Carmen III Burbank Adirondak N.Z. Pink Eye Chancellor Breeses Prolific Epicure Sharps Express Early Rose Brown Rivers Burpee Cooks Favourite King Edward Belle de Juillet Suttons Acquisition British Queen Warrior Gem of the South Manistee
VII	Seedlings	Wilsons Seedlings (4th Year)

and Up-to-Date. Immature seed of each of these varieties was secured out of the growing crop at Leongatha last year, while the ripe seed of each was dug out of the same crops after ripening.

Section 6 has been planted with thirty-eight different varieties, most of which are commonly cultivated in the State, in order that these may be compared in prolificacy, quality, &c., the one against the other. Data will be collected from this section as to the habits and period of maturation of each variety, for the purpose of classification. All of the seed used in this test was saved from the crop at Leongatha last year.

Section 7 is given over to the further testing of the new varieties raised by this Department from seed supplied by Dr. Wilson, of St. Andrew's University, Scotland, and is now being grown for the fourth year. Last year over 130 of these seedlings were planted, out of which about thirty have been retained for this season's trial. From these it is confidently expected that some new varieties may be produced which will be worthy of inclusion amongst the varieties grown commercially in Victoria. Planting at Leongatha was finished on 18th November, 1915, the lateness of the spring having retarded the preparatory cultivation work. Though the crop is scarcely midway through the season at the time of writing, there is a marked difference in the portions differently treated as regards manures and seed control, the most notable being (*a*) in favour of immature seed as against ripe seed; and (*b*) the promise of greater yields given by the heavier dressings of manure in proportion of the weight of these dressings.

An interesting fact in regard to the section on which depth of planting tests are being conducted is that the planting (8 inches) at the end of the first six weeks compared but poorly against the shallower depths of planting, while the improvement was steadily progressive from the 8-inch depth to the shallowest depth.

ANALYSIS OF LEONGATHA SOIL.

Parts per 100,000.

—	Soil.	Subsoil.	For comparison, a good soil should contain—
Nitrogen	157	87	150
Phos. Acid	45	70	150
Potash	58	35	250
Lime	136	204	500
Magnesia	112	84	Not more than lime
Chlorine	14	12	Not more than 35
Reaction	Acid	Acid	Neutral to slightly alkaline

KOO-WEE-RUP.

At Koo-wee-rup, 2 acres have been given to experimental work, and this area has been divided into twenty sections, seventeen of which have been treated differently with regard to manuring, the details of which may be seen on the plan. In designing this experiment, it was decided that the majority of the plots would be treated with manures, costing approximately 21s. per acre, the exceptions to this being the heavier

Kooweerup

Experimental Area, 2 Acres Potatoes

CENTRE ROAD

1	Check
2	Lime 1 Ton, Super 5 cwt.
3	Blood & Bone 5 cwt. S Potash 1½ cwt.
4	Lime 1 Ton. Super 2 cwt. S. Ammonia ½ cwt. S. Potash ½ cwt.
5	S. Potash 1½ cwt
6	Check
7	Super 4½ cwt.
8	Blood 3¼ cwt.
9	Super 3 cwt Blood 1 cwt.
10	Bone & Super 4 cwt.
11	Check
12	Potato Manure 3 cwt.
13	Blood & Bone 2 cwt. S. Potash ½ cwt.
14	Basic Phos. 3 cwt. Blood ¾ cwt. S. Potash ⅓ cwt.
15	S Ammonia 1¼ cwt.
16	Super 3 cwt. S. Ammonia ½ cwt.
17	Basic Phosphate 5 cwt.
18	Blood & Bone 3 cwt.
19	Super 3 cwt. S. Ammonia ¼ cwt S. Potash ¼ cwt.
20	Check

Four Rows this (W.) Side manured with ·4 Cwt. Super. extra

dressings of blood and bone with sulphate of potash, and the plot dressed with lime. The varieties planted here comprise Cook's Favourite, Adirondak, Manistee, and Carman No. 1 and immature and ripe Factors. This area was planted on 20th October, 1915, and on the date of the last inspection the heavier rates of manuring were showing the best growth. In addition to the variety and manure tests at Koo-wee-rup, an interesting trial is being made between sets having weak buds or sprouts, and sets which develop normally strong sprouts; both of these classes of seed being planted on all the varied manurings.

ANALYSIS OF KOO-WEE-RUP SOIL.

Parts per 100,000.

—	Soil.	Subsoil.
Nitrogen	398	141
Phos. Acid	96	57
Potash	75	61
Lime	60	138
Magnesia	145	117
Chlorine	20	12
Reaction	Acid	Acid

CASHMORE HEATH, PORTLAND.

On the heath country at Cashmore, the potato experiments are being carried out on two classes of soil. One is a grey sandy soil, locally described as "flat" land, and the other is a black, sandy soil, very full of fibre, which is commonly termed "hill" land by the residents of Cashmore Heath. The grey soil is responsive to manures, and yields fairly good crops, but on the hill soil the farmers of the district have, so far, been unable to obtain payable results with any crop, though, as may be seen by comparison of the analyses of the two soils, the difference in their chemical contents is not extreme.

ANALYSIS OF CASHMORE HEATH "FLAT LAND."

Parts per 100,000.

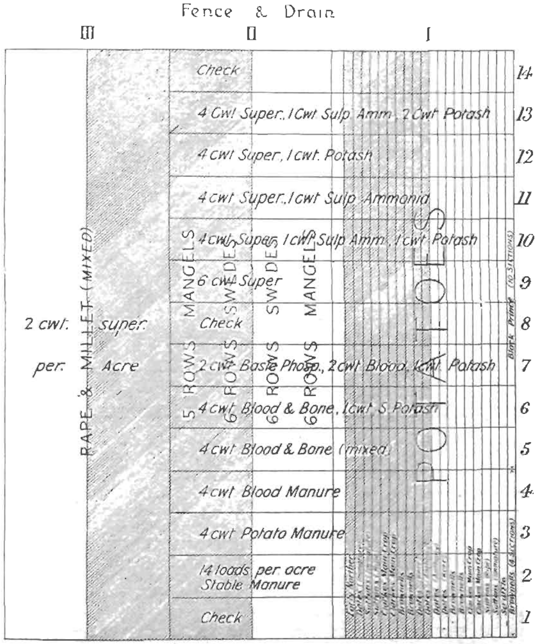
—	Soil.	Subsoil.
Nitrogen	109	35
Phos. Acid	13	10
Potash	17	17
Lime	122	54
Magnesia	99	67
Chlorine	8	8
Reaction	Acid	Acid

The scheme of manuring as done at Cashmore differs from those at Koo-wee-rup and Leongatha, inasmuch as the effect of liming the soil with 1 ton of agricultural lime per acre has been tried with all manures.

Potato Experiments on Flat Land

Cashmore, Portland

Area . 1½ Acres.

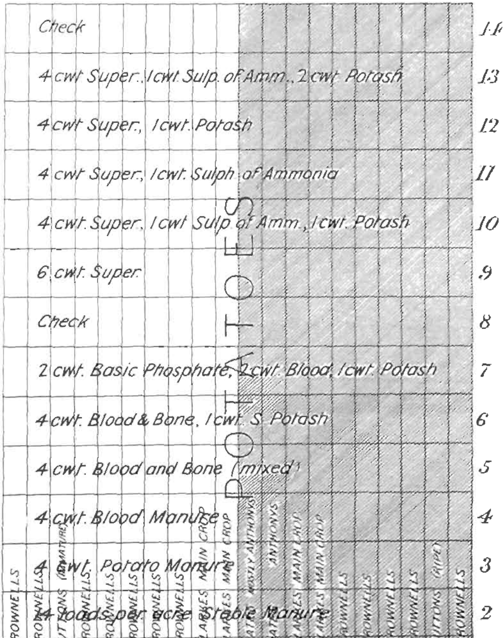


Portions shaded diagonally Limed.

Potato Experiments on Hill Land
Cashmore, Portland

Area, ½ Acre

IV



Portions shaded diagonally limed

The manuring here has twelve variations on the limed and the unlimed portions, making twenty-four variations in all, in which potatoes, mangels, and Swedish turnips are being grown. The varieties of potatoes being tested are immature and ripe Sutton's Abundance, ex Leongatha, Brownell's Beauty, Dates, Clark's Main Crop, Early Norther and Scruffie, all of which are suitable to the soils of the district. The manuring tests on the hill and flat lands are the same, and the plots were planted on 29th November, 1915.

ANALYSIS OF CASHMORE HEATH "HILL LAND."

Parts per 100,000.

—	Soil.	Subsoil.
Nitrogen	118	72
Phos. Acid	11	8
Potash	16	9
Lime	82	62
Magnesia	86	66
Chlorine	8	8
Reaction	Acid	Acid

REMARKS.

The whole of these test plots have been designed with the object of securing definite information as to the most profitable procedure in potato cultivation, that is, the procedure which will most economically produce the greatest production per acre. The manures in every case were broadcasted by hand prior to planting. At Portland the potatoes were ploughed into the ground, but at Leongatha and Koo-wee-rup planting was done by one of the greatest labour savers in all the collection of farm implements, namely, the potato planter, one of the machines which has done much to lessen the troubles of the potato grower in the matter of labour.

The climatic conditions since planting time to date have not been favorable to the potato crop. A late cold spring which retarded planting was followed by a spell of dry weather which has, since 1st December, had no breaks of weather of sufficient consequence to materially assist the crop; but the season is young yet, and much may happen.

The interest taken in the experiments carried out last year was gratifying, and it is hoped that this interest may be more than maintained this year, as this season's results should be of considerably greater value than those of the first year, inasmuch as it is expected that they will, in the majority of cases, confirm the findings of last season.

The plots are at all times open to inspection by farmers and others interested throughout the growing period.

At the Labour Colony, Leongatha, the principal of these experimental stations, the work incidental to these tests which this Department is carrying out has been ably and willingly assisted by the manager, Mr. J. J. Willoughby. At Koo-wee-rup, the Department has been granted the use of land on the farm of Mr. John Wadsley, of the Five Mile Drain, one of the pioneers of the district; while at Cashmore, Portland, Mr. G. A. Taylor, an enthusiastic grower, has been good enough to devote portion of his land to this experimental work.

GOLDEN WHEAT.

VICTORIA'S RECORD HARVEST.

Worth over £12,000,000.

The practical assurance that the Victorian farmers would reap the benefit of the record harvest and an exhortation to them to prepare to surpass next season the achievement of this formed the subject of a statement from the Minister of Agriculture yesterday. Mr. Hagelthorn said:—

"The gathering of the 1915 harvest is now practically completed, and it is fairly certain that the yield will considerably exceed 50,000,000 bushels and easily establish a new record. The acreage sown to wheat (4,000,000 acres) represented an increase of over 35 per cent. over the previous highest record, and the aggregate yield will probably prove to be 50 per cent. greater. This result is due to the favorable season, to the energy and enterprise shown by the farmers, and to the financial assistance given by the State Government. The farmers have responded magnificently to the appeal for an increased acreage made twelve months ago. In view of the many difficulties confronting farmers —the scarcity and high price of fodder, shortage of stock and lack of funds owing to the failure of the crop through drought—the response of the wheat-growers is extremely gratifying.

"At one time it was thought that low prices must be taken for our surplus wheat, in view of the scarcity of freight; but, owing to the operation of the wheat scheme, satisfactory prices are being obtained, not only for the surplus exported overseas, but also for the wheat used for home consumption. Thanks to the assistance of the British Government, the Wheat Commission hopes to market the great bulk of the Australian crop before the end of the year. If the present prices of wheat be maintained, Victoria's crop will be worth over £12,000,000, and the exported surplus will bring in over £10,000,000. Such an addition to our income will be very welcome, and, incidentally, it indicates the importance of developing the agricultural resources of the State. As much as 200,000 tons of flour will be exported from Australia during the next two months to feed our allies, and no doubt other orders will follow in due course. Every bag of wheat that can be raised within the Empire means a bag less to be imported from foreign countries, and the Allies are in need of all the surplus of Australia, Canada, and India to satisfy their requirements.

"The harvest of 1915 is now over, and preparations for the crop of 1916 must now be made. I have no doubt that the wheat-growers will spare no effort again to cultivate as large an acreage of crop as possible, and to cultivate it well. The general rain experienced during the last twenty-four hours will enable farmers to cultivate their fallows, and lay the foundations for a good crop during the next season; it will also enable a large area of land to be worked up for the coming year. It has been shown that every inch of rain that fell over the wheat-growing areas during the growing period of the crop corre-

sponded to a bushel of wheat per acre over the whole State. By conserving such rains as we have just had by judicious fallowing, the farmer is guaranteeing the success of his future crop.

"The course of the wheat market is always uncertain," the Minister added, "but there is no reason why satisfactory and remunerative prices should not continue. It is therefore to the farmers' own interests to prepare for a large acreage, and to cultivate this acreage with the best possible skill. It is also in the interests of the State to see that he receives adequate encouragement in this work."

—*Age*, 29th January, 1916.

STANDARD TEST COWS.

Quarterly Report for Period ended 31st December, 1915.

During the period 29 cows completed their term under the regulations. Of this number 20 qualified for their certificate.

One new herd was entered for testing, viz.:—

Falkenberg Bros., Colac. (Jersey.)

Individual returns are as follows:—

Mrs. A. BLACK, Noorat. (Jersey.)

Completed since last report, 4. Certificated, 0.

F. CURNICK, Malvern. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat required	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Peerless Pearl ..	3771	2.2.15	9.2.15	273	17½	6,017	5·27	317·23	200	361¾

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll.)

Completed since last report, 6. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat required	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Carribea	Not yet allotted	3.1.15	10.1.15.	273	18	5,518	4·29	236·92	200	270
Ardath	"	15.1.15	22.1.15	273	13	6,189½	4·78	296·05	250	337½
India	"	8.3.15	15.3.15	273	26½	8,146	4·11	335·23	250	382¾

GEELONG HARBOUR TRUST, Marshalltown. (Ayrshire.)

Completed since last report, 3. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat required	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Winnie of Glen Elgin	1850	25.2.15	4.3.15	273	12½	6,265½	4·18	262·20	250	299

T. HARVEY, Boisdale. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat required	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Dainty 6th ..	Not yet allotted	10.1.15	17.1.15	273	19½	5,306	5·66	300·33	175	342½

A. W. JONES, Whittington. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat required	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lady Grey 1st of St. Albans	Not yet allotted.	9.3.15	16.3.15	273	17½	5,255	6·61	347·36	175	396

C. G. KNIGHT, Cobram. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat required	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Mistletoe of Tarapirr	2984	23.1.15	30.1.15	273	17	5,282	5·29	279·32	200	318½

C. G. LYON, Heidelberg. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Silver Audrey ..	1378	19.1.15	26.1.15	273	6½	5,887	4·85	285·74	250	325¼
Silvermine III. ..	715	19.2.15	26.2.15	273	27	8,037½	4·98	400·16	250	456¼
Hawthorn of Banyule	*1064*	*16.3.15*	*23.3.15*	*273*	*21½*	*7,557½*	*5·09*	*385·12*	*250*	*439*

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 9. Certificated, 9.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Mystery IX. of Melrose	3665	21.1.15	28.1.15	273	23½	7,047½	5·98	421·60	250	408½
Mermaid II. of Mel*rose*	Not yet allotted	1.2.15	8.2.15	273	18	6,733	5·13	345·36	250	393¾
Purity of Melrose IV.	1324	6.2.15	13.2.15	273	20	5,634½	5·72	322·48	250	367½
Jessie IX. of Melrose	3654	11.2.15	18.2.15	273	22	7,359	5·69	418·62	250	477¾
Lassie Fowler III. of Melrose	1137	22.2.15	1.3.15	273	23	8,121	5·49	446·29	250	508¾
Zoe V. of Melrose ..	1496	22.2.15	1.3.15	273	16½	6,159½	6·58	405·26	250	462
Jenny Lind VIII. of Melrose	3651	18.3.15	25.3.15	273	13	6,332	5·47	346·38	200	394¾
Rarity V. of Melrose	1344	20.3.15	27.3.15	273	20	8,183½	5·24	429·06	250	489
Mystery VIII. of Melrose	3664	25.3.15	1.4.15	273	15½	6,027	6·13	369·68	250	421½

MOLASSES FOR SOLVING THE POTASH PROBLEM.

A practical try-out for a method of obtaining potash fertilizer will soon take place at a New Orleans distillery where molasses is used in large quantities. It is a fact that 106 tons of potash are wasted daily by the 25 or more distilleries in this country subjecting molasses to the processes of fermentation. The New Orleans company is planning to install the process of saving potash in distillery waste recenty brought to the attention of the public by the Bureau of Foreign and Domestic Commerce. It should be possible to make fertilizer from this otherwise worthless material at a price that will meet competition even after the war is over.

—Extract from *Pure Products*, Dec., 1915.

BUTTER-FAT IN CHEESE.

By R. T. Archer, Senior Dairy Inspector.

To further demonstrate the equitability of purchasing milk for cheese-making according to its butter-fat contents a number of cheeses has been made by Mr. G. C. Sawers, Departmental Cheese Instructor, from milk containing different percentages of fat, and the results are given below:—

Six cheeses were made each from 500 lbs. of milk, varying in fat contents from 5.4 per cent. to 2.6 per cent. The amount of cheese made varied from 58½ lbs. to 46½ lbs.—a difference of 12 lbs., which, at 6d. per lb., amounts to 6s., or 12s. per 100 gallons, equal to 1.44d. per gallon, practically 1½d. Yet many suppliers to cheese factories in Victoria to-day consider payment at per gallon most satisfactory, though there is such a difference in value for the purpose for which it is bought.

It may be said that this wide variation in quality is unusual. At one factory last season the writer found the variation from 5.4 per cent. to 2.3 per cent. The last sample contained 46 per cent. of added water. Is further comment necessary?

It is not the purpose of this article to enter into the question of whether it is more profitable to make the milk into butter or cheese, but to show that for cheese-making it is just as necessary to pay for the milk according to quality, as it is for butter-making. From the result of the analysis it will be seen that when very rich milk is made into cheese by itself rather more loss of fat in the whey is incurred. This is not so, however, when the milk is pooled and the high test milk mixed with that of a low test.

On the other hand, it will be noticed that cheese from rich milk contains a far higher percentage of fat than that made from poor milk, and the more fat there is in cheese the higher quality it is, and any loss of fat that may occur in rich milk is fully compensated for by the improvement in general quality of the cheese.

The analysis shows that the cheese made from the rich milk contains only 33.54 per cent. of moisture. That from the poorest contains 40.57 per cent. The cheese from the rich contains 40.47 per cent. fat. The cheese from the poor contains 25.46 per cent.

A study of the table will show that each cheese was made from 500 lbs. of milk, varying in fat contents from 5.4 per cent. to 2.6 per cent.

Milk with the highest test, viz., 5.4 per cent. made 58½ lbs. of cheese. Valuing that at 6d. per lb. for convenience gives 29s. 3d., equal to 7d. per gallon.

The milk containing 2.6 per cent. fat made 46½ lbs. of cheese, equal to 23s. 3d., equal to 5½d. per gallon.

The milk testing 3.8 per cent. fat yielded 51½ lbs. cheese, equal to 25s. 9d., equal to 6d. per gallon.

The milk testing 4.7 per cent. gave 56½ lbs. cheese, equal to 28s. 3d., equal to 6¾d. per gallon.

To obtain the different percentages of butter fat cream had to be added or extracted. Normal milk would show greater variation, as

the solids vary, to a large extent, in proportion to the butter fat. The results from normal milk would be still more in favour of milk rich in fat.

Much misapprehension exists with regard to the best and most equitable method of purchasing milk at a cheese factory. Notwithstanding all that has been written and said about the matter, there are many who pretend to believe that the fat contents of the milk is little or no indication as to its value for cheese-making. Much investigation and experiment by leading dairy experts and chemists has been conducted to determine the best method to be adopted, and there is no doubt that the casein test and the fat test combined is the best. Although both these tests are simple, the former as worked out by E. B. Hart and the latter by Dr. Babcock or Dr. Gerber, many directors of cheese factories pretend to think they are too complicated, and desire to adhere to the method of payment abandoned by enlightened and progressive boards over twenty years ago. As the double test, *i.e.*, casein and fat, involves double the work, it is generally conceded that the fat test is sufficiently reliable as a guide to the value of milk for cheese-making and may be adopted with confidence as an equitable basis of payment. That the milk should be paid for according to its cheese-making capacity must be evident to those who do not find it to their interest, probably to cover dishonest practices, to adhere to the system of payment at per gallon irrespective of quality.

In the following table comment on the column "Value of Cheese at 6d. per lb." is necessary. It must be remembered that cheese rich in fat is of better quality and will command a higher price than the lower grade, therefore the difference in value shown in this column will, in actual fact, be greater than indicated.

Date.		Weight of Milk.	Test.	Fat in Milk.	Value, at 1s. per lb.		Cheese from Press.	Value, at 6d. per lb.		Value of Milk per Gallon.	Fat in Cheese.	Fat in Cheese.	Fat Lost in Manufacture.	Analysis, October, 1914.				
														Moisture.	Fat.	Casein.	Ash.	Salt in Ash.
		lbs.		lbs.	s.	d.	lbs.	s.	d.	d.	%	lbs.	lbs.	%	%	%	%	%
1.	Aug. 4	500	5·4	27	27	0	58½	29	3	7·02	40·47	23·67	3·39	33·54	40·47	22·04	3·95	1·48
2.	„ 5	500	4·7	23½	23	6	36¼	28	3	6·78	36·14	20·41	3·08	34·71	36·14	25·22	3·93	1·32
3.	„ 6	500	4·2	21	21	0	55½	27	0	6·66	33·95	18·84	2·15	34·94	33·95	27·57	3·54	1·14
4.	„ 7	500	4·0	20	20	0	53½	26	0	6·40	32·33	17·29	2·70	35·37	32·33	28·64	3·66	0·84
5.	„ 10	500	3·8	19	19	0	51½	25	9	6·18	31·94	16·44	2·55	36·34	31·94	28·40	3·32	0·60
6.	„ 11	500	2·6	13	13	0	46½	23	3	5·58	25·46	11·82	1·16	40·59	25·46	30·60	3·35	0·30

VICTORIAN RAINFALL.

Fourth Quarter, Year 1915.

From the table given below it will be seen that, with the exception of the Mallee and Wimmera districts, and also parts of the Western, the remainder of the State had rainfall in excess of average, more especially

so in the North-East. The greatest deficiencies occurred in the Northern Mallee and the Southern Wimmera. For November the greater portion of Victoria experienced rainfalls, in many instances much below the normal, the deficiencies being greatest in the Northern area; but in the West Coast, and also in parts of Gippsland, many stations had abundant rains, and taken as a whole these two districts approximated closely to the normal. December was an exceedingly dry month throughout, at some stations no rain whatever being recorded, more particularly so in the newer Mallee. In the Wimmera and Mallee good crop yields were being obtained, and reports were generally of a cheerful character, some crops averaging as high a standard as 42 bushels to the acre. In the North, good to fair crops were being gathered, but in some instances the yields did not come up to anticipations, frosts being the principal cause, and severe thunderstorms also mitigated against the hoped-for results. A more prosperous season was experienced in the Central North; grass abundant, and stock in splendid condition. Reports from the North-East were hardly so cheerful, as the inadequate November rains tended to lessen the yield. In the Western District crops exceeded anticipations, and in many places hay crops of over 4 tons to the acre were met with. The same applies to the South Central, although rain is now badly required there. In Gippsland grass was dry, but still abundant, and the stock in good condition, though the milk supply was lessening owing to the scarcity of the December rains. Most rivers and creeks were low throughout the whole of the State.

District.	—	October.	November.	December.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean	57	11	0	68
	Normal	105	73	92	270
	Per cent. departure from normal	−46	−85	−100	−75
Mallee South	District Mean	88	26	36	150
	Normal	110	90	97	297
	Per cent. departure from normal	−20	−71	−63	−49
North Wimmera ..	District Mean	102	34	29	165
	Normal	151	109	100	360
	Per cent. departure from normal	−32	−69	−71	−54
South Wimmera ..	District Mean	101	45	13	159
	Normal	185	132	115	432
	Per cent. departure from normal	−45	−66	−89	−63
Lower Northern Country	District Mean	162	19	32	213
	Normal	132	118	111	361
	Per cent. departure from normal	+23	−84	−71	−41

VICTORIAN RAINFALL—*continued.*

District.	—	October.	November.	December.	Quarter.
		Points.	Points.	Points.	Points.
Upper Northern Country	District Mean.. ..	189	35	35	259
	Normal	174	146	133	453
	Per cent. departure from normal	+9	−76	−74	−43
Lower North-East ..	District Mean.. ..	431	39	100	570
	Normal	238	193	195	626
	Per cent. departure from normal	+81	−80	−49	−9
Upper North-East ..	District Mean.. ..	508	160	140	808
	Normal	369	299	281	949
	Per cent. departure from normal	+38	−46	−50	−15
East Gippsland ..	District Mean.. ..	333	140	124	597
	Normal	282	222	267	771
	Per cent. departure from normal	+18	−37	−54	−23
West Gippsland ..	District Mean.. ..	431	221	37	689
	Normal	314	259	271	844
	Per cent. departure from normal	+37	−15	−86	−18
East Central	District Mean.. ..	399	155	63	617
	Normal	323	276	287	886
	Per cent. departure from normal	+24	−44	−78	−30
West Central	District Mean.. ..	213	97	47	357
	Normal	197	174	165	536
	Per cent. departure from normal	+8	−44	−72	−33
North Central ..	District Mean.. ..	246	84	36	366
	Normal	216	194	177	587
	Per cent. departure from normal	+14	−57	−80	−38
Volcanic Plains ..	District Mean ..	185	104	25	314
	Normal	223	183	167	573
	Per cent. departure from normal	−17	−43	−85	−45
West Coast	District Mean.. ..	304	192	13	509
	Normal	261	197	193	651
	Per cent. departure from normal	+16	−3	−93	−22

N.B.—100 points = 1 inch.

H. A. HUNT,
Commonwealth Meteorologist.

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commenced 15th April, 1915; concluding 14th April, 1916.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Six Birds. Pen No.	Breeds.	Owner.	Totals.			Position in Competition.
			15.4.15 to 14.12.15	15.12.15 to 14.1.16	Nine months.	
		LIGHT BREEDS. WET MASH.				
38	White Leghorns ..	G. McDonnell	1,116	162	1,278	1
34	" ..	H. McKenzie and Son ..	1,104	149	1,253	} 2
2	" ..	E. A. Lawson	1,109	144	1,253	
42	" ..	W. M. Bayles	1,081	153	1,234	4
19	" ..	L. G. Broadbent ..	1,074	140	1,214	5
8	" ..	C. J. Jackson	1,059	147	1,206	6
5	" ..	J. J. West	1,035	136	1,171	} 7
7	" ..	Marville Poultry Farm ..	1,031	140	1,171	
21	" ..	E. B. Harris	1,048	108	1,156	9
30	" ..	A. E. Silbereisen ..	1,003	143	1,146	10
23	" ..	Fulham Park	987	155	1,142	11
59	" ..	W. G. Osburne	985	156	1,141	12
28	" ..	R. Lethbridge	981	148	1,129	13
3	" ..	J. H. Gill	981	146	1,127	14
9	" ..	J. Schwabb	1,005	120	1,125	15
54	" ..	W. G. Clingin	968	144	1,112	16
16	" ..	N. Burston	977	130	1,107	17
6	" ..	F. Doldissen	986	118	1,104	18
11	" ..	J. B. Brigden	967	136	1,103	19
39	" ..	W. M. Sewell	982	119	1,101	20
50	" ..	John Hood	969	129	1,098	21
18	" ..	D. Adams	951	145	1,096	22
44	" ..	Mrs. F. M. Oliver ..	968	127	1,095	23
4	" (5 birds)	R. Hay	977	114	1,091	24
26	" ..	A. Mowatt	982	102	1,084	25
1	" ..	Mrs. H. Stevenson ..	953	131	1,084	26
10	" (5 birds)	A. E. Tuttleby	966	116	1,082	27
13	" ..	T. Hustler	967	114	1,081	28
68	" (5 birds)	W. G. Swift	997	66	1,063	29
24	" ..	Lysbeth Poultry Farm ..	940	122	1,062	} 30
20	" ..	R. W. Pope	917	145	1,062	
32	" ..	F. Hodges	943	115	1,058	32
49	" (5 birds)	Bennett and Chapman ..	942	112	1,054	} 33
27	" ..	J. A. Stahl	907	147	1,054	
58	" ..	Thirkell and Smith ..	896	155	1,051	35
43	" ..	H. I. Merrick	900	148	1,048	36
25	" (5 birds)	Giddy and Son	926	110	1,036	} 37
15	..	H. N. H. Mirams ..	900	136	1,036	
33	" (5 birds)	A. W. Hall	906	128	1,034	39
22	" ..	S. Buscumb	868	151	1,010	40
60	" ..	H. C. Brock	907	104	1,011	41
47	" ..	J. C. Armstrong ..	877	131	1,008	42
36	" ..	Weldon Poultry Yards ..	881	125	1,006	43
48	" ..	C. J. Beatty	887	118	1,005	44
55	" ..	W. N. O'Mullane ..	888	116	1,004	45
41	" ..	J. A. Donaldson ..	850	139	989	46
12	" ..	G. Hayman	856	119	975	47
46	" ..	R. Berry	828	132	960	48
40	" ..	C. O. Dunn	817	124	941	49
45	" ..	South Yan Yean Poultry Farm	823	117	940	50
52	" ..	A. A. Sandland	825	113	938	51
57	" ..	B. Mitchell	804	108	912	52
37	" ..	A. Ross	776	132	908	53
14	" ..	W. Flood	756	125	881	54
31	" ..	L. McLean	718	126	844	55
56	" (5 birds)	C. Hurst	694	104	798	56
		Total	52,441	7,240	59,681	

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-16—*continued*.

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.12.15	Totals. 15.12.15 to 14.1.16	Totals. Nine months.	Position in Competition.
		LIGHT BREEDS.				
		Dry Mash.				
80	White Leghorns ..	W. H. Robbins	1,151	139	1,290	1
68	" ..	H. McKenzie and Son ..	1,056	159	1,215	2
79	" ..	Lysbeth Poultry Farm ..	982	134	1,116	3
63	" ..	A. H. Padman	966	142	1,108	4
76	" ..	A. A. Sandland	962	138	1,100	6
69	" ..	E. MacBrown	965	131	1,096	6
62	" ..	Benwerren Egg Farm ..	944	142	1,086	7
64	" (2 birds)	W. M. Bayles	966	94	1,060	8
66	" ..	E. A. Lawson	924	131	1,055	9
67	" ..	C. C. Dunn	893	154	1,047	10
72	" ..	Mrs. E. Zimmerman ..	913	126	1,039	} 11
65	" ..	Thirkell and Smith ..	906	133	1,039	}
78	" ..	H. Hanbury	919	116	1,035	13
71	" ..	Moritz Bros.	888	146	1,034	14
61	" ..	Mrs. H. Stevenson ..	911	116	1,027	15
77	" ..	*South Yan Yean Poultry Farm*	778	136	914	16
73	" ..	C. L. Lindrea	779	125	904	17
74	" ..	J. H. Gill	685	115	800	18
75	" (5 birds)	Fulham Park	677	104	781	19
		Total	17,265	2,481	19,746	
		HEAVY BREEDS.				
		Wet Mash.				
86	Black Orpingtons ..	O. E. Graham	1,077	119	1,196	1
97	" ..	Marville Poultry Farm ..	1,033	116	1,149	2
89	Rhode Island Reds	E. W. Hippe	953	114	1,077	3
85	Black Orpingtons ..	H. H. Pump	968	101	1,069	4
92	" ..	J. Ogden	917	148	1,065	5
100	" (5 birds)	*J. H. Wright*	980	82	1,062	6
81	" ..	Mrs. T. W. Pearce ..	962	98	1,060	7
93	" ..	L. W. Parker	943	108	1,041	8
88	" ..	J. McAllan	918	92	1,010	9
91	" ..	A. Greenhalgh	891	107	998	10
99	" ..	L. McLean	880	93	973	11
90	" (5 birds)	Oaklands Poultry Farm ..	878	85	963	12
84	" ..	Cowan Bros.	852	106	958	13
87	" ..	W. C. Spencer	861	86	947	14
98	Favorolles ..	K. Courtenay	768	138	906	15
95	Silver Wyandottes ..	W. H. Forsyth	775	92	867	16
94	*Black Orpingtons (5 birds)*	*D. Fisher*	805	58	863	17
83	Black Orpingtons ..	G. Mayberry	720	87	807	18
82	White Wyandottes	J. B. Brigden	554	81	635	19
96	White Orpingtons ..	Stranks Bros.	572	30	602	20
		Total	17,307	1,941	19,248	

MONTHLY REPORT.

Weather conditions for the month have been very trying, the birds being affected on more than one occasion. The variations in temperature have been as much as 42 deg. F. in six hours.

Some birds are now moulting and broodies are plentiful. The health of the birds is satisfactory, and the egg yield good for the season. Temperature, lowest 56 F.; highest 109 F., in houses. Rainfall, 63 points.

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Orchardists will be busy during February with the gathering and marketing of early and export fruit. In gathering fruit every care should be taken to see that it is not in any way bruised or crushed. This is often the cause of fruit decaying so rapidly and of the deterioration of fruit in the fruit room. All fruit should be handled as lightly as possible.

Another point to be observed is the necessity for grading fruit for the market. Grading pays, and it pays handsomely. A buyer will never offer a good price for mixed grades, more especially as he will probably require to grade it if he wishes to resell it. A good price will always be obtained for first-grade fruit, while the low price offered for mixed grades can generally be secured for the lowest grades as well. The more exact the grading, the more profit for the fruit-grower; the more care in packing, the more returns for the producer; and so the greater care and exactness, the better it pays to grow fruit.

A final spraying for codlin moth will be necessary this month. The *fallen fruit should all be collected and boiled, and all crevices and* hiding places searched for larvæ. The season has been favorable to the development of bryobia mite and woolly aphis, and, as soon as the fruit has been picked from the trees attacked by these insects, a good spraying of strong tobacco water should be given. This will minimize to a great extent the winter work. Cultivation should still be proceeded with, and the soil kept in a continual condition of surface friability. This is especially necessary at this time of the year. With a good supply of moisture in the soil, it should be well conserved, so that the growing period of the trees may be continued until early autumn, when the trees should be allowed to ripen their wood.

Budding may be continued, and if an early start were made the buds may be allowed to push their way out into growth, so that they may harden and be ready for pruning in the proper season. Buds that are placed in late season should be left dormant until the springtime. Summer pruning may also be continued, and all superfluous terminal lateral growths removed, so as to strengthen the remaining buds and also to force out fruit buds for next season.

Fumigation.

Evergreen trees, including those of the citrus family, that are infested with scale, should now be sprayed or fumigated to rid the trees of this pest. For spraying, a weak red oil emulsion, lime and sulphur spray, or resin wash will be found useful for the purpose. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an airtight sheet or tent, and hydrocyanic gas should be generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are ex-

cessively dangerous, and great care should be exercised in their manipulation. A wooden, enamel, or earthenware vessel is placed inside the tent, the vessel containing a mixture of 4 fluid ounces of sulphuric acid, and 12 fluid ounces of water, the acid being placed in the vessel first. Four ounces of cyanide of potassium should then be quickly dropped into the vessel, and the tent closed down at once; the bottom of the tent all round should be covered with soil to prevent any of the gas escaping. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at night-time or on a cloudy day, and the foliage of the trees must be thoroughly dry.

Vegetable Garden.

Celery crops will now be a prominent feature in the vegetable section. The seed may be sown from January to March, and succession plantings should be carried out occasionally during those months. The growth of celery should be quick; a fair supply of water and a good rich, loose soil are helpful to its growth.

Ample water will now be required in the vegetable garden. The surface should be kept well hoed, and mulchings of manure should be given wherever possible.

Cabbage, carrot, turnip, radish, lettuce, peas, cauliflower, &c., seeds may now all be sown, and young plants from any seed beds may be planted out.

Flower Garden.

Constant watering and hoeing will now be required to keep the flower garden in a condition of success. Cannas will require manuring; the old flowering stems should be removed to make way for the new growths. Dahlias and chrysanthemums will need a great deal of attention, staking the growths as they develop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking of water during the hot weather, and liquid manure or quick acting fertilizers should be given when the flower buds are developing. When chrysanthemum buds are very small liquid manure should be applied. Roses may now be summer pruned; all weak growths should be removed, and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned, the flowering growths removed, and, unless the seed is required, all seeds heads should be cut off.

Cuttings of pelargoniums, zonale and regal, may now be planted; delphinium spikes that have finished flowering should be cut down to make way for new growth, the plant being watered and manured. Seeds of perennial and hardy annual plants may now be sown, and a few bulbs for early flowering may be planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

REMINDERS FOR MARCH.

Live Stock.

Horses.—Feed as advised last month. Those in poor condition should be "fed up" in anticipation of winter.

Cattle.—Cows in milk should have plenty of succulent fodder and water easy of access. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows and those required for town milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter and give the best returns for the season, and be dried off when the grass is dry and scarce. Calves should be given lucerne hay or crushed oats where grass is not available.

Pigs.—Sows about to farrow should be provided with short bedding in well-ventilated sties. See that the pigs have shade, and water to wallow in. There should be plenty of cheap feed now, and pigs should be highly profitable. Read articles on breeding, feeding, &c., of pigs in *Journals* for April, 1912, June, 1913, May, 1915.

Sheep.—All ewes should be kept strong for lambing. Crutch round tails and lessen accumulation of discharge, and consequent attraction to the fly pest at lambing time. Clear wool from round udders and teats and thereby save many a lamb in bad weather; especially is this necessary in the case of young ewes of the Merino and Lincoln crosses. Clear wool from eyes also. In crutching ewes when close to lambing lay them over carefully, grasp by the thigh low down, not by the flank as is generally done, which is a careless practice. Pure British breeds of ewes and very coarse cross-breds may still be only coming in season; rams should be left mated to make sure. Have good grass paddocks, if season favorable, to cut off ewes with early-born lambs into, for extraordinary prices will be available again this winter.

Poultry.—Cull out the drones and get rid of surplus cockerels. Keep forward pullets well fed—eggs are rising in value. Repairs to houses should be done this month. Thoroughly cleanse all houses and pens. Spray ground and houses with a 5 per cent. solution of crude carbolic acid, to which should be added a little lime—this will act as a safeguard against chicken pox; burn all refuse and old feathers. Provide a liberal supply of green food. For each moulting hen, add a teaspoonful of linseed to the morning mash. Use tonic in water, which should be kept in cool shady spot.

Cultivation.

Farm.—Work fallow where possible for autumn sowing of cereals. Sow winter fodder crops, such as rye, barley, and vetches. Prepare land for lucerne plots for autumn seeding. Make silage of maize and other crops for winter use.

Orchard.—Prepare new land for planting; plough deeply and subsoil; leave surface rough. Plant out strawberries after first rain. Plant crops for green manure. Continue to fight the Codlin Moth.

Vegetable Garden.—Prepare ground for winter crops. Plant out seedlings in moist soil. Sow cabbage, cauliflower, lettuce, early peas, swede turnip, beet, carrot, radish, and early onions.

Flower Garden.—Cultivate and water. Feed dahlias, chrysanthemums, and roses. Plant out shrubs, trees, and all kinds of bulbs. Sow hardy annuals. Plant geranium and pelargonium cuttings. Spray for Aphis, Red Spider, and Mildew.

Vineyard.—Select scions, if not done last month. Where ripening is difficult, assist by removing basal leaves only, as soon as berries change colour. This is the month for drying currants, sultanas, and gordos (Lexias and Clusters). Do not pick before grapes are properly ripe. For instructions for packing grapes for export, apply to Department. Shipments should be made in March and early April.

Cellars.—Vintage month. For light dry wines, pick as soon as grapes are ripe; do not wait for over-maturity, as is so often done. Pay attention to acidity; correct same if necessary with tartaric acid or late grapes. Acidimeter supplied by Department; price, 3s. 6d. Sulphiting and the use of pure yeasts are strongly recommended, as they insure production of sound wine; further information supplied on application.

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LAMB-BREEDING TESTS.

(*By H. C. Wilson, Manager, Research Farm, Werribee, and A. J. Whelan, Field Officer.*)

The development of the fat-lamb industry during the past ten years has brought into prominence the problem of the most profitable type of lamb to raise for export purposes and local trade.

To test this matter was the object of a series of experiments commenced three years ago at the State Research Farm, Werribee. It is intended to continue the tests for a further period, and in the meantime to briefly review the results to date.

The principle followed was to select first cross ewes of uniform quality and to mate these with representative rams of different breeds.

The main objects of these tests were briefly:—

1. To ascertain the comparative market values of the various crosses.
2. To compare the values of the fleece of each cross at shearing, and
3. To test the prepotency of the various rams used.

Lincoln merino, first cross 4-tooth ewes of uniform type and quality were secured in December, 1912. These ewes were used for the 1913-14 experiments only, young 2-tooth ewes being secured in December of 1914 for the third-year trials. Each year the ewes were divided into six sections, particular care being taken to preserve uniformity throughout.

The following rams were joined with the ewes in January, 1913 and 1914:—Lincoln, Border Leicester, English Leicester, Dorset Horn, Shropshire, and Southdown. In the third year, however, it was decided to replace the English Leicester with the Suffolk, and mating

took place in January, 1915, with the following six rams:—Lincoln, Border Leicester, Suffolk, Dorset Horn, Shropshire, and Southdown.

During the first year fifty ewes were used in each section, whilst forty were used in the second and third years.

All the ewes were branded and tagged to avoid any possible errors before being joined with the rams. A typical flock ram of each of the above breeds was selected with the object of preserving comparative uniformity in each section of the trials.

Mating and Gestation Period.

In the third week of January of each year the rams were joined with the ewes in each group of sheep and placed in equal and separate paddocks; but in order to secure equality of feeding the sheep were moved from paddock to paddock in regular rotation during the season of mating. The rams were drawn after a period of seven weeks from the time of joining; the six separate lots of ewes were boxed and pastured together until a fortnight before lambing, when they were drafted according to brands and ear tags, and again placed in separate paddocks for the lambing season.

Lambing Percentages.

Lambing usually started in late June and early July, and from Table No. 1 it will be seen that both breed and season show influences on the lambing percentages:—

TABLE NO. I.
LAMBING PERCENTAGES.

Breed of Ram.	1913.					1914.					1915.						
	No. of Ewes Mated.	No. of Lambs Dropped.	No. of Lambs Alive.	No. of Lambs Dead.	Per cent. of Lambs Alive.	No. of Ewes Mated.	No. of Lambs Dropped.	No. of Lambs Alive.	No. of Lambs Dead.	Per cent. of Lambs Alive.	No. of Ewes Mated.	No. of Lambs Dropped.	No. of Lambs Alive.	No. of Lambs Dead.	Per cent. of Lambs Alive.	Per cent. of Lambs Dead.	Average per cent. Alive 3 Years.
Lincoln ..	50	62	51	11	102	40	33	32	1	80	40	48	38	10	95	25	92·3
Border Leicester ..	50	47	42	5	84	40	37	36	1	90	40	37	35	2	87·5	5	87·16
English Leicester	50	52	41	11	82	40	42	40	2	100	Nil†	..	..	..	..	..	91‡
Dorset Horn ..	50	49	43	6	86	40	43	40	3	100	40	37	34	3	85	7½	90·3
Shropshire ..	50	51	41	11	82	40	37	36	1	90	40	36	33	3	80	7½	84
Southdown ..	50	49	48	1	96	40	34	33	1	82·5	40	41	36	5	90	12½	89·5
Suffolk*	..	..	..	..	..	..	..	..	..	..	40	34	27	7	69·5	17·5	..

* Not in Experiment 1913 and 1914. † Not mated 1915. ‡ Average for two years.

There were a number of lambs lost each season; the heavy mortality in the first year may be attributed to the bleak conditions, absence of

shelter, and cold winds, which predominated particularly in 1913; 1914 was milder, and consequently the percentage of deaths was lower.

In the third year the old ewes were sold, and 2-tooth ewes were secured of similar quality to further the experiment. Young rams were also purchased, the old ones being sold with the ewes in December of 1914.

The mating of 2-tooth ewes and rams naturally resulted in somewhat lower percentages in the third year, and a few weak lambs. Particularly was this the case in point of the Lincoln cross, where numbers of twins were born and were unable to be supported by their young mothers.

The low percentage of the Suffolk cross in the third year can, I think, be attributed to the fact that the stud which this ram was drawn from had only been imported from England a few months before the mating period.

Crossbred Ewes with Lincoln Ram.

We hope to be able to show very much higher lambing percentages this season (the fourth year of the trials), because the ewes and rams are now 4-tooths, very strong and vigorous, and the season promises to supply better conditions than have been experienced for the past three years.

Data Recorded During Lambing and Growth of Lambs.

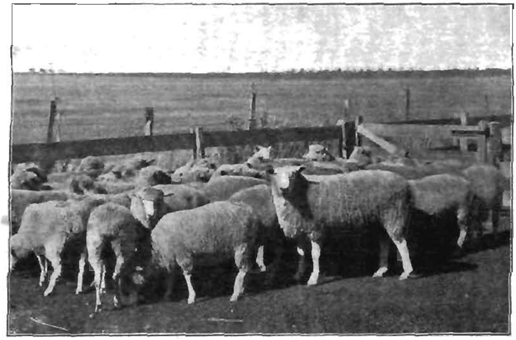
No. 1.—Lincoln Cross.

Lambing in this section seemed in the first two years to occur regularly in the early part of July. In 1915 the lambing in this cross seemed more distributed than it was in the two earlier years, but this was in keeping with the other crosses, and no doubt has for its explanation the fact that both ewes and rams were young.

A marked feature in the development of these lambs was the fact that they grew rapidly, produced an abundance of wool, but did not fatten like the Down crosses until nearing maturity.

No. 2.—Border Leicester Cross.

These lambs came also very regularly in the early part of July, grew rapidly, and showed the distinctive character of the Border Leicester sire. They possessed great length and height of body, and a wool somewhat lighter in quality than the Lincoln cross, but better than the Down crosses. They did not seem to be in the pink of condition as freezing lambs until they had reached the age of sixteen to seventeen weeks. The lambs were undoubtedly hardy, and the percentage of deaths was very much lighter than was the case with the Lincoln cross; in fact, the mortality was as low as any of the crosses, and compared favorably with Southdown.



Crossbred Ewes with Border Leicester Ram.

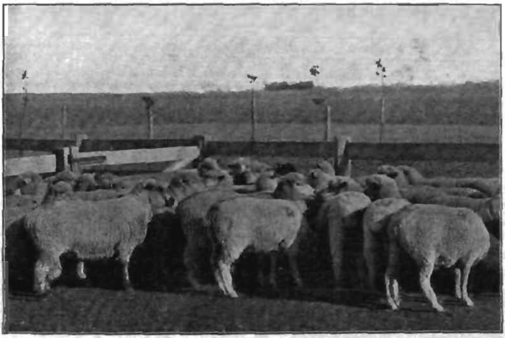
No. 3.—English Leicester Cross.

This section of the experiment was only carried out for two years, and was replaced in the third by the Suffolk cross, it being thought that the Border and English Leicester crosses were too similar in character, and after deciding to include the Suffolk the English Leicester cross was dropped in its favour. The lambs of the English Leicester cross were born somewhat more irregularly than either the Lincoln or Border Leicester, and did not grow quite so well, nor come to maturity any quicker than either of the above crosses. The wool was somewhat similar to that of the Border Leicester, but at shearing time it was found that the ewes cut slightly heavier fleeces. These English Leicester cross lambs seemed to come to maturity between sixteen and seventeen weeks of age.

No. 4.—Dorset Horn Cross.

The lambs of this cross seem in the face of the facts which we have gathered during the past three years of the experiment to be unpopular

Crossbred Ewes with Dorset Horn Ram.



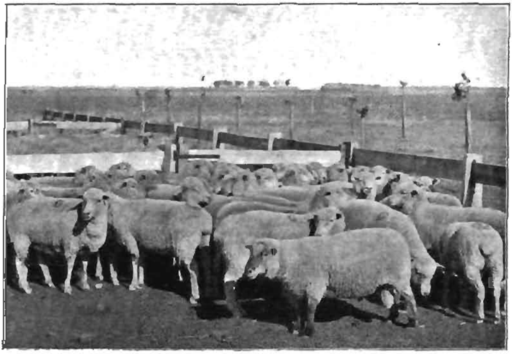
Crossbred Ewes with Shropshire Ram.

with the buyers at Newmarket. Though the lambs themselves seem to fill every particular in regard to quality and maturity percentage, they failed to attract the buyers.

Lambing was regular and frequent in the early weeks of July; the lambs grew quickly, were fat all the time, and retained comparatively heavy carcass weights when slaughtered. The wool seemed to be a great deal shorter than that from the long-woolled crosses, and somewhat lighter in character. A prominent growth of horn is unquestionably the unpopular feature from the buyers' stand-point, and some butchers claim that the carcass when hung is too long and bony.

No. 5.—Shropshire Cross.

This cross of lambs seem to drop throughout the three years of the experiment somewhat more irregularly than the long-woolled sections, although they showed decided uniformity and fair quality throughout their growing period until maturity about the sixteenth week. The lambs had a tendency during the later weeks of the growth to develop an excessive quantity of wool about the face and eyes; this is a feature



Crossbred Ewes with Southdown Ram.

which somewhat explains their comparative unpopularity if kept as weaners. As a freezing lamb, however, they are undoubtedly popular amongst the buyers.

The fleece is shorter than the long-woolled crosses, but the weight compares favorably with both the Border and English Leicester. A conspicuous feature in this cross was the total absence of twin lambs during the three years of the experiments.

No. 6.—Southdown Cross.

The lambs in this cross were dropped regularly early in July each year, the percentage of deaths was very low, and the percentage of lambs raised compared favorably with the averages of the other crosses. Very few twin lambs were born, and this probably accounts for the average lambing percentage recorded. The lambs were exceptionally hardy,

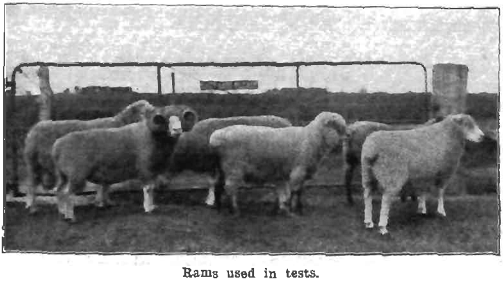
and are adaptable to weather the severe winters which are prevalent on the Werribee plains. The Southdown cross lambs seem to be able to retain their lambs' fat fully until maturity, and were prime from fourteen to fifteen weeks of age.

The wool is short and light, and this cross should be profitable where early, quick-maturing freezing lambs are intended to be produced at handy distance from the market.

Crossbred Ewes with Suffolk Ram.

No. 7.—Suffolk Cross.

The Suffolk is a comparatively new breed to Australia, and at present only isolated flocks are in existence. In 1915 this breed was introduced into the fat-lamb trials, and last year the lambing records



Rams used in tests.

were low, the percentage of deaths considerably above the average, and undoubtedly the results may be accounted for by the fact that the Suffolk ram used was hardly acclimatised, being recently imported from England.

The lambs were not dropped until the end of July, although the mating was effected at the same date as the other crosses; but, despite this fact, the lambs at fourteen to fifteen weeks were as heavy as the

heaviest of the other crosses at seventeen weeks, which speaks volumes in favour of this cross in respect to their early-maturing and rapid-growing qualities.

The wool on the lambs is undoubtedly scanty on the belly, face, and points, but the extra bulk of carcass presents surface for wool production, and the comparative weights of the lamb fleece can be noticed in Table No. 3.

Marketing of the Wether Lambs.

At approximately seventeen weeks the wether lambs of each of these crosses were weaned, drafted from the ewe lambs, and sold at the Newmarket sale yards in separate and presentable lots to create genuine and comparative competition among the buyers for slaughtering as butchers' supplies or freezing for export.

These wether lambs were sold in the wool, and their comparative values realized at Newmarket were published in the daily papers for the past three years. Table No. 2 shows the comparative results to date.

TABLE II.

LAMB BREEDING TRIALS.

Return *re* Wether Lambs *ex* First-cross Lincoln-Merino Ewes at Maximum Age of Seventeen Weeks.

Ram.	No.	Auction Price realized.	Average Live Weight.	Maximum Weight of Carcass.	Minimum Weight of Carcass.	Average Weight of Carcass.	Average Weight of Pelts.	Average Weight of Offal.	Per Cent. Offal Loss.
Season 1913 Results.									
		s. d.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
Lincoln	22	15 0	69·36	42·0	29·0	35·5	9·95	23·91	34·5
Border Leicester .	20	13 9	68·6	44·0	28·0	36·8	8·35	23·45	34·2
Dorset Horn	20	13 6	74·2	53·5	31·5	40·15	9·1	24·95	33·6
English Leicester .	20	13 1	66·5	42·5	25·5	35·95	8·55	22·5	33·8
Shropshire	23	12 10	67·6	55·5	28·5	36·06	8·73	22·77	33·7
Southdown .. .	21	11 6	58·66	42·0	26·0	32·0	7·61	19·04	32·4
Average	..	13 3	67·5	46·6	28·1	36·07	8·71	22·77	33·7
Season 1914 Results.									
Border Leicester ..	15	16 2	86·80	58	37	44·10	9·20	33·50	38·5
Dorset Horn	15	14 11	85·40	51	35	43·10	8·80	33·50	39·13
English Leicester ..	15	14 1	77·0	45	31	37·0	10·2	29·80	38·7
Lincoln	15	14 0	80·0	50	29	39·0	11·40	29·60	37·0
Southdown	15	14 0	71·40	44	27	36·13	10·6	27·42	38·22
Shropshire .. .	15	13 10	71·50	41	24½	34·7	10·33	26·47	36·92
Average	..	14 6	78·68	48	30½	39·0	10·08	30·05	38·08
Season 1915 Results.									
Suffolk	13	26 0	90·5	60	39	47	10·0	33·5	37·0
Border Leicester ..	12	25 10	93·33	59	38	47	11·33	35·0	37·5
Shropshire	19	25 0	88·0	56	36	44	10·0	34·0	38·6
Lincoln	17	24 3	80·75	55	30	37	11·5	32·25	39·9
Southdown	14	23 2	80·0	50	31	39	9·5	31·5	39·3
Dorset Horn	12	23 0	84·0	50	34	41·5	9·0	33·5	39·8
Average	..	24 6½	84·76	56	34·66	42·58	10·22	33·29	38·68

Shearing of the Ewe Lambs and their Wool Values.

To ascertain the true value of the different crosses in this experiment from a wool-producing stand-point, the ewe lambs from each cross were retained for three weeks after the sale of the wethers and shorn, and the fleeces were classed and valued. This was undertaken by Mr. Plumerage, Wool Expert of the Gordon Technical College, and we are greatly indebted to him for his careful work which he has done so willingly. Table No. 3 shows the comparative weights, quality, and values of the seven crosses in the experiment.

TABLE III.

LAMB BREEDING TRIALS.

Results of Ewe Lambs Shorn and Values of Wool Seasons 1913-14.

Ram used.	No. of Lambs Shor .	Weight of Wool.	Firsts.	Seconds.	Quality of Wool in Bradford Counts.	Value of Wool.		Value of Wool per Lamb.	Class Yield, Scoured.	
						Firsts.	Seconds.		Firsts.	Seconds.
		lbs.	lbs.	lbs.	*s. s.*	*s. d.*	*s. d.*	*s. d.*	%	%
Lincoln ..	39	126·9	105·9	21	40—46	0 9½	0 6¾	2 5½	61·40	56·25
Border Leicester	43	88·58	78·26	10·32	48—50	0 10	0 6¾	1 8¾	65·62	56½
English Leicester	39	101·4	84·63	16·77	44—46	0 10½	0 6¾	2 1·6	71·87	56½
Dorset Horn ..	48	106·56	89·28	17·28	48—52	0 10¼	0 6½	1 10	57·81	56¼
Shropshire ..	42	92·0	81·0	11·0	48—56	0 8¼	0 6½	1 6·14	65·62	56¼
Southdown ..	38	87·78	71·44	16·34	50—56	0 8¾	0 6¾	1 7¼	56½	56¼

Season 1915.

Ram used.	No. of Lambs Shor .	Weight of Wool.	Firsts.	Seconds.	Quality of Wool in Bradford Counts.	Value of Wool Firsts.	Value of Wool Seconds.	Value of Wool per Lamb.	Class Yield Firsts.	Class Yield Seconds.
Lincoln ..	20	82·40	67·0	15·40	40—56	0 9½	0 7½	3 1·63	65·2	56·88
Border Leicester	22	68·20	51·70	16·50	50—60	0 10½	0 8½	2 7·46	68·64	63·71
Suffolk Cross ..	9	36·45	27·72	8·73	56	0 8½	0 6½	2 8·48	57·20	58·45
Dorset Horn ..	10	48·45	36·48	11·97	58	0 11	0 7¾	2 1·84	72·0	63·48
Shropshire ..	13	45·89	34·97	10·92	50—56	0 9	0 6½	2 6·51	72·28	56·0
Southdown ..	20	45·20	31·80	13·40	56—58	0 8½	0 6	1 5·45	74·0	53·71

In the above table the wool yields for the years 1913 and 1914 were placed together for valuation. By so doing the comparative results have not been altered.

SURPLUS LUCERNE HAY.

By Temple A. J. Smith, Chief Field Officer.

Recent complaints by growers, that present prices for lucerne hay, viz., £4 per ton, are not sufficiently remunerative, open up the question as to whether the most profitable method of disposing the crop, is to place it on the market in large quantities in seasons of plenty when there is an abundance of lucerne, oaten and wheaten hay, and natural grasses.

The purchaser of hay from the grower buys to make a profit on the material handled, a profit that the grower himself should be able to pocket, provided he goes the right way about it. This fact has been realized by farmers in other parts of the world, with the result that hay and grain is fed to stock of various kinds on the farms on an enormously greater scale than is the case in this State. Taking the maize crops of the United States, America, as an instance, we find that no less than 75 per cent. of the crop is fed on the farm, only 3 per cent. is exported, and the balance, 22 per cent., fed to horses, &c., in the city, and this in the largest maize-producing country in the world. It is obvious that all fodders carry a certain food value, which varies from time to time, according to the prices of beef, pork, milk, &c., and the owner of such fodders should make it his business to ascertain when and where it pays him best, to either sell in the open market, or utilize his material at home.

There is an immediate saving in feeding fodder on the farm, in that the cost of baling, wire, carting to rail, trucking, commission, &c., is avoided—these items alone amounting to 25s. to 30s. per ton on lucerne hay, and proportionally on other crops. Added to this inferior hay of bad colour, or poorly-harvested hay, which might be almost unsaleable, could be turned into money through stock feeding, which might otherwise be an absolute loss. Further, the more stock the farm can be made to turn off, the more manure will be available, thus keeping up the standard of fertility of the land and increasing the reputation of the farm as a money producer, and a higher value per acre would naturally follow.

Lucerne, properly speaking, should not be fed by itself to secure the best results, but should be supplemented with grain, bran, pollard, or concentrates of some kind in order to make up a balance ration for especial purposes. When lucerne hay is used for pigs, it should also be ground fine to prevent waste, and to aid digestibility should be softened by soaking in water.

Feeding for Pork.—The following results of experimental feeding for pork give a useful idea as to the quantities required and the comparative values when fed to various kinds of stock.

Approximately, 14 lbs. of lucerne will make 1 lb. of pork when fed to pigs, consequently 2,240 lbs. of lucerne will produce 160 lbs. of pork, which, at 6d. per lb., gives a return of £4 per ton for the hay on the farm, equivalent to £5 10s. on the market after all costs of baling, freight, &c., have been deducted. When prices for pork reach

1s. per lb., as is the case at the present time, the value of the lucerne would be doubled, and it appears somewhat extraordinary that this has not been realized earlier.

Green lucerne for pigs is better than hay, and lucerne mixed with maize, wheat, bran and pollard, in proper proportions, will result in even better profits. Henry, on "Feeds and Feeding," says:—"Where pigs are pastured on lucerne and fed 2 lbs. to 2½ lbs. of maize per 100 lbs. of pig per day, the amount of maize required to produce 100 lbs. gain in weight is 331 lbs."

Lucerne pasture is admittedly better than any other for pigs, but it should not be overstocked, and small paddocks should be used so that the lucerne from time to time, may be cut for hay. This has the effect of sustaining the lucerne plots.

Cotrell, of the Colorado Station, states "that pigs fed with grain and lucerne will make, under good management, 500 lbs. to 1,000 lbs. gain from an acre of lucerne, after deducting the gain due to the feeding of the grain."

Feeding for Milk.—For milk production in a trial lasting twelve weeks with 8 cows at the New Mexico Station, Vernon found that 246 lbs. of lucerne hay alone produced 100 lbs. of milk. These results have been confirmed elsewhere. Taking the milk at 6d. per gallon this leaves £2 5s. per ton of hay on the farm to £3 15s. per ton on the market. This is apparently low, but when dairying is followed the bulk of the lucerne would be fed green, and the cost of hay making avoided, also lucerne should be fed to dairy cows with concentrates in order to obtain full values, and by products from the cows increase the returns.

Fattening Cattle and Sheep.—When fed to steers two years old 1,100 lbs. of lucerne hay gave 100 lbs. gain; therefore, 1 ton of hay should give 200 lbs. gain, which, at 6d. per lb., would equal £5 per ton, and at 4d. per lb. equal £3 6s. on the farm.

Here again, if fed green a saving in cost and labour would be made, also the prices taken for meat are far below present values.

For raising fat lambs for export the cheapest system is to provide small paddocks in which the lucerne can be allowed to reach its maximum growth before the sheep are turned in, and constant changes to fresh paddocks made. One cutting each year for hay from every paddock should be obtained, and a good system of cultivation followed in all.

In buying stock for fattening care should be taken to secure animals likely to return the greatest profit, as for instance, 6 or 8 tooth sheep will fatten quicker, and at less cost than either very young or old sheep. A good dairy cow will also give a greater proportionate return than a cow with a smaller milk yield for the amount of food supplied, while in the case of pigs good forward stores of the right weights will result in a quicker turn over and larger profits. It does not follow that the lowest priced stock of any description are the cheapest, as much depends upon suitability for the purpose required, and the margin of profit on the higher priced stores may easily be greater than that on the cheaper lines.

Further, it is obvious that were the hay or green fodder more generally used on the farms, markets would not be glutted to the same extent; this would insure better market values.

RESEARCHES ON WHEAT SELECTION.

I. Does the Value of a Wheat Grain Depend on its Position in the Ear?

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, and W. Heber Green, D.Sc., Lecturer in Agricultural Chemistry, University of Melbourne.

In 1912 a series of experimental plots were laid out at the Rutherglen Experiment Farm with the object of determining the extent to which improvement of wheat was possible by various methods of selection. This was a continuation of work which had been carried out at the Parafield Wheat Station by one of the authors.* A question which arose at the outset was "Are all the grains of the wheat ear as like to one another as the proverbial two peas in a pod?" or have they an individuality which finds its expression in their varying vitality under which we may include germinating capacity and prolificacy? In other words, does the value of a wheat grain depend on its position in the ear?

At the suggestion of Mr. T. M. Whelan, Field Officer in charge of the plots, an experiment was carried out in 1913, in which an ear of wheat was dissected and each individual grain was planted in such a position that its identity could be established.

Unfortunately, an accident prevented the resultant crop from being harvested and the weight of individual plants determined at Rutherglen, and in 1914-15 similar tests were made at the State Farms at Rutherglen and Werribee, with more complete material, and it is proposed in this preliminary paper to briefly record some of the results of this part of the investigation.

Up till 1913 the seeds were planted in nursery rows, but the variations in yield of individual plants from one end of the row to the other were considerable, and suggested that these differences were due, not to inherent genetic factors, but mainly to environmental influences. In the endeavour to eliminate these environmental variations a modification of the system of centgener plots suggested by Hays† has been used for the last two years.

The essential feature of this system is that 100 grains are planted in ten rows of ten plants each, and this square is protected by one or more border rows of grain of similar parentage.

At harvest time the border rows are first removed and the prolificacy of the seed under investigation is determined by the aggregate yield of the 100 plants. The mechanical device for planting these seeds with accuracy, at a uniform distance apart and at a uniform depth, has been previously described in the *Journal.*‡

In preparing the soil for the centgener plots great care was taken to secure as uniform a seed bed as possible.

To avoid the differential soil packing caused by the tread of the horses, the harrows and roller were hauled across the field with the aid of long ropes and pulleys care being taken to avoid any overlap

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* *Journal of Agriculture*, South Australia. 1910.
† W. M. Hays. Plant Breeding Bulletin 29, Dept. of Agriculture, U.S.A.
‡ *Journal of Agriculture*, Victoria, November, 1914, p. 649.

of these cultivating implements and consequent extra tilth of narrow strips. Neither horses nor workmen trod on the plot throughout the period of preparation. When ready for planting long planks were placed along the spaces intended for paths, and by arranging the centgener plots in squares of four, it was possible to plant the seeds with the centgener planting board without putting foot on any of the soil reserved for the plants.

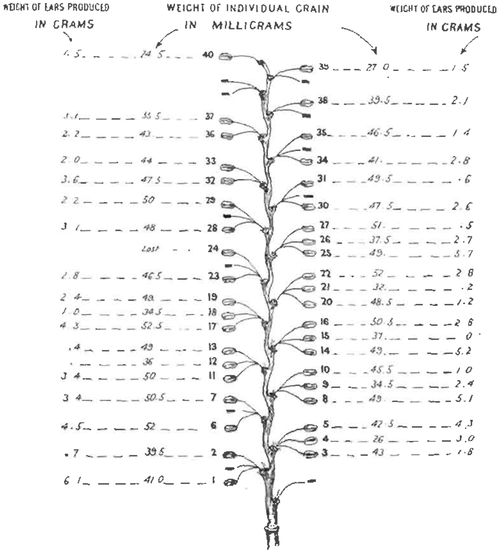


Fig. 1.—Diagram of ear of Federation Wheat, showing position of grains in ear and their individual weights and prolificacy.

In order to prevent any plant surrounding the blanks caused by the non-germination of seed securing an advantage over their less fortunate competitors, seeds of Indian H, an early maturing variety of wheat, were used to fill up these gaps. Thus we endeavoured to insure that in each plot 100 plants of known parentage should struggle for an existence on terms of equality in a uniform environment.

A brief reference to the structure of the wheat ear is now necessary. Botanically, the ear is a spike, bearing on alternate sides of a flattened

rachis a series of spikelets, each consisting of one, or two, or more florets which, unless sterile, ultimately carry the ripe grain. The spikelets normally carry two to three grains, but when seasonal conditions are favorable four or five may develop.

The variety selected for investigation was Federation, whilst typical ears of College Eclipse and Huguenot were also examined. Each grain was removed from the ear by a forceps, identified by a number, and weighed on a microbalance* designed for the purpose, and finally planted in a recorded position in a centgener plot.

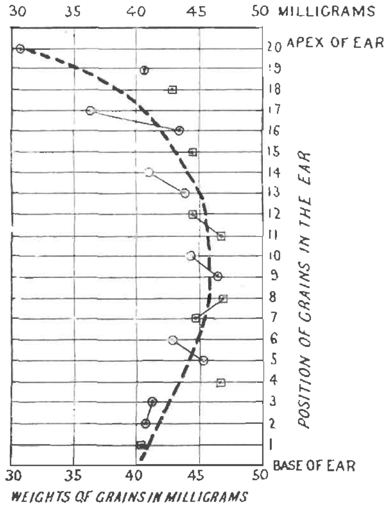


Fig. 2.—Graph of weights of individual grains in a small ear of Federation Wheat.

The germination was determined at intervals and notes on the early growth taken. When ripe the whole plant was removed by the roots, weighed, and the amount of grain obtained.

In weighing the grains prior to planting, and marking their position in the ear, it soon became apparent that well defined relationships existed between the weight of the grains and their position in the ear.

* Society of Chemical Industry, Victoria, 1915, p. 268.

In all over 1,500 separate weighings were made, involving forty-three ears of wheat. Two outstanding features were noted:—

1. The weights of the individual kernels towards either extremity of the ear, and particularly towards the apex, were invariably less than the kernels in the middle of the ear.

2. Where three or more grains were produced on the one spikelet the tendency was for one of the inner or *median* kernels to suffer in its development; hence it was found that, as an almost invariable rule, the grains in the centre of the spikelets are lesser in weight, impoverished, and, if they happen to germinate, produce inferior plants.

These points are graphically illustrated in the diagrams:—

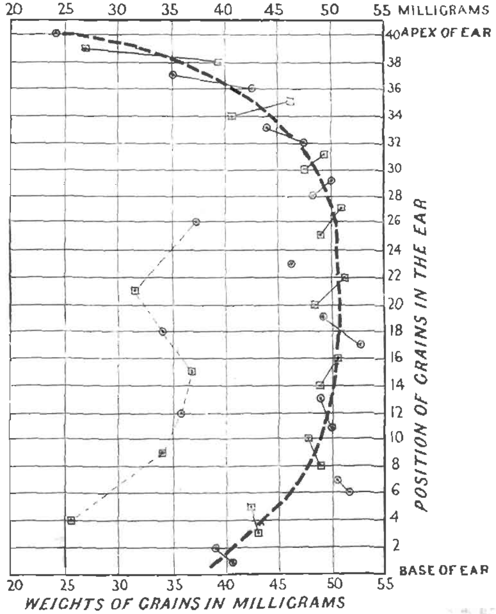


Fig. 3.—Graph of weights of individual grains of a typical ear of Federation Wheat (See also Fig. 1).

Fig. 1 is a diagrammatic representation of one of the ears of Federation wheat examined, showing the position of each grain in the ear, and giving its weight in milligrammes as obtained by the microbalance, and the weight of the ears obtained by growing the resultant plant in a centgener plot.

A perusal of the figures representing the weights of the individual grains show that the intermediate grains of each spikelet are of considerably less weight than those of the outside grains of the same spikelet. Further, it will be noted that the grains towards either extremity, and particularly the apex, are also undersized, and on the average produce relatively small yields.

These points are more strikingly illustrated in Figs. 2, 3, and 4, where the weights of individual grains in milligrammes have been plotted against their position in the ear.

They represent typical ears with maxima of 2, 3, and 4 grains per *spikelet respectively*.

The grains taken from the same spikelet are connected by faint lines, and those from the right and left spikelets are denoted by small squares and circles respectively. The dotted line represents the general trend of the weights from the base to the apex of the ear. As already noted, there is an increase in the weights of kernels as we pass from either extremity to the middle of the ear.

In Figs. 3 and 4 the intermediate grains have been plotted separately from the outside grains of the corresponding spikelets, and are connected in the diagrams by faint dotted lines. The graph shows clearly the lesser weights of the median grains as compared with the adjoining grains of the same spikelet.

It is obvious that the weight of the ears produced show considerable and erratic variations in spite of the elaborate precautions to insure uniformity of growing conditions; but, by taking the average of a number of experiments, these individual fluctuations do not prevent definite conclusions being arrived at.

In order to compare the relative germinating capacity and prolificacy of the median grains and the other small grains at the base and tip with that of the remainder of the grains of the ear, the results as obtained from three of the typical Federation heads which were dissected may be quoted. As indicated above, each grain was planted in recorded positions in centgener plots, and the weight of ears from each plant obtained after harvesting.

The results are summarized in Table I.:—

TABLE I.

COMPARISON OF YIELD OF PRODUCE FROM MEDIAN GRAINS WITH THAT FROM HEAVY GRAINS WHICH ORDINARILY COMPOSE FIRST GRADE WHEAT.

Group.	Treatment.	No. of grains taken.	Average Weight of Seed.	Percentage Unproductive.	Average weight of ears produced per plant.
			Milligrammes		Grammes.
1	All *median* grains and grains under 35 milligrammes	38	27·8	16%	1·81
2	Grains over 35 milligrammes	80	43·5	4%	2·86

These figures show that the median grains, together with the light grains at either extremity of the head, have a lower percentage of germination and give a much lower average yield than the grains of the remainder of the head.

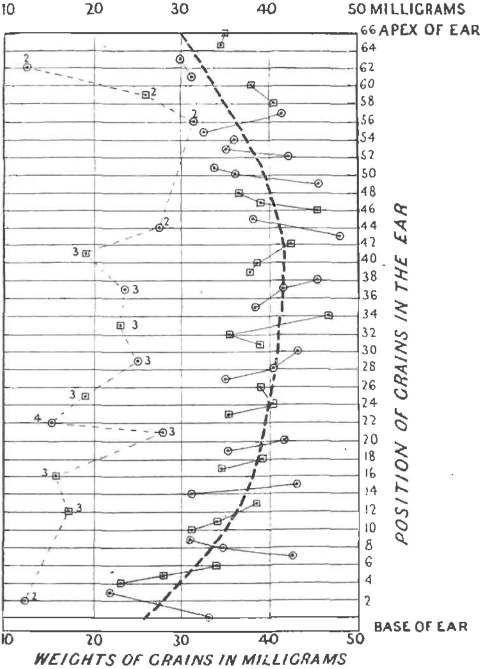


Fig. 1.—Weights of individual grains in a large ear of College Eclipse Wheat.

Hence prime seed, coming from a centrifugal barrel grader (which separates grain into grades according to the weight and size), should be expected to give increased returns over ungraded seed. The grading eliminates the majority of the non-prolific median grains and the undersized, unproductive grains from the extremities of the ear.

It is also evident that in applying mass selection to wheat for an improvement in yield, improvement would more rapidly follow if the upper and lower portions of the selected ears were rejected, and the balance of the ear threshed and graded to eliminate the less prolific median grains.

We wish to express our appreciation of the hearty co-operation of Field Officers G. S. Gordon, H. A. Mullett, and T. M. Whelan, who have assisted in the arduous work entailed in the preparation, planting, and harvesting of the centgener plots.

SUMMARY.

1. The weight of the individual grains may be described as following the shape of the ear, the grains increasing in weight from either extremity *to the middle of the ear.*

2. The median kernels of the spikelets are invariably lesser in weight and impoverished, and if they germinate they produce less prolific plants.

3. As these grains are undersized and low in weight an efficient grading machine will eliminate them.

4. These results justify the practice, often recommended, of rejecting *the upper and lower portions of the ears and grading the remainder* when applying mass selection to wheat for an improvement in yield.

(To be continued.)

FARM BREVITIES.

The best advice for the man engaged in mixed farming is to keep *on mixing. Do not let a rush of wheat push everything else out of the* way.

France is the only country in Europe that is self-supporting in normal times. The country produces sufficient corn and meat for the whole population.

German starch factories, making starch from potatoes, represent a thriving industry. The turnover of the co-operative starch factories before the war was about £3,500,000 a year.

A middle white sow belonging to Mr. E. Kemp Toogood, Southampton (England), has given birth to twenty-two live pigs at a farrow. The same animal in 1913 produced twenty-one young at a birth.

It pays to let all farm animals have access to powdered charcoal. They will usually eat it freely. Most of the so-called stock foods contain charcoal as one of the most useful ingredients.

Cowsheds should be kept in a condition of great cleanliness, and even the air that the animals breathe should be pure. These two conditions are indispensable for the production of sound, good milk.

The light of a lamp will be much clearer if a small lump of salt is placed in the bottom of the lamp reservoir. Also before screwing in the burner, soak the wick in vinegar, then thoroughly dry before using. This makes it burn brighter and last longer.

RESULTS OF EXPERIMENTS, 1915.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

I.

PERMANENT ROTATION TESTS—WERRIBEE.

An interesting demonstration of the value of a systematic rotation of crops on hay and grain yields is afforded by the results obtained from a series of tests at the State Research Farm, Werribee. The tests were commenced three years ago on land which was known to have been cropped continuously for twenty-six years, and which was in a very low state of fertility. It was anticipated that such worn out land would respond more quickly to the influence of rotation cropping than newer land. Ten different systems of crop rotations were tested side by side, with the object of determining which system would give the greatest returns per acre over a series of years. In four of the rotations hay was grown, and in the remainder wheat was the principal crop. On some plots wheat and hay were grown continuously year after year; on others these crops were alternated with bare fallow. On others again forage crops, such as peas, barley, and rape were grown in rotation with the principal crop. The results were as follow:—

WHEAT CROPS.

	bus.	lbs.
1. *Wheat after wheat continuously*	10	26
2. Wheat after bare fallow	21	54
3. Wheat after peas and rape	23	53
4. Wheat after bare fallow and pasture (Mallee rotation) ..	22	37
5. Wheat after bare fallow, pasture, oats (Wimmera rotation)	24	43
6. Wheat after peas and barley	27	15

HAY CROPS.

	tons.	cwt.
1. Oaten hay continuously	1	6¼
2. Oaten hay after bare fallow	2	12¼
3. Oaten hay after bare fallow and barley	3	1½
4. Oaten hay after peas and barley	2	13½

The rainfall during the growing period of the crop was 10.84 inches. A perusal of these returns reveals the following results:—

1. The continuous cropping of land with the same crop, a method frequently practised in the district, gives returns which barely pay expenses of production.

2. By bare fallowing increases of 11 bushels of wheat and 26 cwt. of hay were obtained over the continuously cropped plots.

3. The greatest and most profitable increases, however, were obtained by growing wheat and hay in rotation, with forage crops such as peas and barley. The wasteful bare fallow is thus eliminated, a crop is grown every year, and the final crop is as heavy as that grown after a

bare fallow. Thus wheat grown after peas and barley in a three-course rotation gave 27¼ bushels per acre as against 24¾ bushels when grown after bare fallow, as in the Wimmera rotation. Similarly the hay crop after peas and barley gave a return of 2 tons 13½ cwt., as against 2 tons 12¼ cwt. when grown after bare fallow.

These results suggest that in districts similarly situated to Werribee, enjoying a fair rainfall, wheat and hay crops grown in rotation with forage crops may be expected to give greater returns per acre than any other method of rotation. Such practises assist in maintaining the fertility of the soil unimpaired.

An example of the success of such rotation may be seen from the yield of a 100-acre hay crop at the Werribee farm. This field was cropped in 1913 with wheat, in 1914 with peas, and fed off with sheep, and in 1915 with oats. Under this system of rotation the average yield from this field exceeded 3 tons per acre.

PERMANENT FERTILISER TESTS—WERRIBEE.

The yields of wheat in the Permanent Fertiliser Trials at the State Research Farm, Werribee, for the season 1915 afford some interesting comparison of the value of differential manurial dressings on the wheat yield. Twenty plots of a ½ acre each were set apart for the testing of different combinations of fertilisers on the growth of wheat. The rainfall up to the end of November was 15.22 inches, of which 10.84 inches fell during the growing period; and the yields of the different plots varied from 19 to 30 bushels per acre. The following table summarizes the results for 1915, and also shows the average yields for the past three years:—

	Season, 1915. Bushels.	Average for Three Seasons, 1913–14–15. Bushels.
1. No manure	20	11
2. Superphosphate, ½ cwt.	27½	16
3. Superphosphate, 1 cwt.	28¾	17¾
4. Superphosphate, 1½ cwt.	29	18
5. Superphosphate, 2 cwt.	28	18
6. Superphosphate, 1 cwt., and nitrate of soda, 40 lbs. (with seed)	30	17¼
7. Superphosphate, 1 cwt., and nitrate of soda, 49 lbs. (in spring)	30	17½
8. Superphosphate, 1 cwt., and sulphate of potash, ½ cwt.	28½	16½
9. Superphosphate, 1 cwt.; sulphate of potash, ½ cwt.; and nitrate of soda, ½ cwt.	28	15½
10. Bone fertiliser, 1 cwt.	25¼	13
11. Thomas' phosphate, 1 cwt.	25½	13
12. Superphosphate, ½ cwt.; Thomas' phosphate, ½ cwt.	26¾	14¾
13. Superphosphate, 1 cwt.; and lime, 5 cwt.	28½	15¾
14. Superphosphate, 1 cwt.; and lime, 10 cwt.	27¾	15¼
15. Superphosphate, 1 cwt.; and lime, 20 cwt.	27	14½
16. Stable manure, 10 tons per acre	24½	15¾
17. Stable manure, 10 tons; and lime, 10 cwt.	26½	16
18. No manure (continuously cropped)	19¾	10¾
19. Superphosphate, 1 cwt. (continuously cropped)	22¾	14

The past season has been fairly favorable for wheat at Werribee, and as the late spring rains assisted the development of the more backward plots the response to the differential treatment with fertilisers is less noticeable than usual. *The results, both for the 1915 crop and* the averages for the last three years, appear to justify the following tentative conclusions:—(1) Superphosphate is the most profitable of all artificial manures that can be applied to the wheat crop; (2), the amount that can be profitably applied per acre is considerably in excess of what is applied in general farm practice in the wheat areas; (3), the gross profit per acre over unmanured land steadily increases as the application increases from ½ cwt. to 1½ cwt.; (4), the highest net profit, however, is obtained by applying 1 cwt. of superphosphates per acre. Thus, taking the average of the three years' tests, ½ cwt. of super., costing 2s. 6d. per acre, gave an increased yield of 4 bushels 54 lb., which, at 4s., gives a net profit of 17s. 1d. per acre over the unmanured plot. A dressing of 1 cwt., costing 5s. per acre, gives an increased yield of 6 bushels 41 lbs., or a net profit of 21s. 7d. per acre, after deducting the cost of the manure. Moreover, the indirect effect of the heavier dressing, in stimulating the subsequent growth of grass, and increasing the stock-carrying capacity of the land, is much greater than that of the lighter dressing; (5), basic slag and bonedust applied either separately or in combination with superphosphates give less profit than the same quantity of superphosphates applied by itself; (6), lime, applied either in heavy or in light dressings, has not, so far, profitably influenced the yields of wheat at Werribee; (7), nitrogenous manures do not increase the net profits in ordinary seasons, especially when bare fallowing is practised. Nitrate of soda gave a substantial and profitable impetus to the hay crop during the past season, but its effect on the grain crop has barely covered the cost of application. In view of the high prices ruling for wheat in the world's markets, the questions of quantities and kinds of fertiliser to use are of relatively greater importance than in times when low prices prevail.

The results obtained at Werribee may be considered as typical of what response may be expected from the various fertilisers in districts with a rainfall of 10 inches to 12 inches during the growing period of the wheat.

PERMANENT MANURE TESTS—LONGERENONG.

The results for the 1915 manurial trials conducted by the Department of Agriculture at the Longerenong Agricultural College afford an interesting illustration of the fertility of the Wimmera soils when seasonal conditions are favorable.

Twelve different manurial applications were tested side by side, and the yields for the past year ranged from 36 to 54 bushels per acre. These yields are in remarkable contrast to those of 1914, when, owing to the drought, the yields from a similar series of plots varied from 2 to 7 bushels per acre.

The results for 1915, together with the average yield for the past three years, are summarized in the following table:—

Treatment.	Yield per acre, 1915.		Average yield for 3 years, 1913–15.
	Bushels.		Bushels.
1. No manure	37·53	..	19·32
2. Superphosphate, ½ cwt.	49·44	..	26·73
3. Superphosphate, 1 cwt.	51·33	..	28·77
4. Superphosphate, 2 cwt. .. .	54·72	..	30·16
5. Superphosphate, 1 cwt., lime, 5 cwt. ..	52·16	..	29·30
6. Superphosphate, 1 cwt., lime, 10 cwt. ..	49·80	..	28·92
7. Superphosphate, 1 cwt., lime, 20 cwt. ..	46·88	..	27·99
8. Basic slag, 1 cwt.	40·88	..	21·43
9. Basic slag, ½ cwt., superphosphate, ½ cwt.	46·08	..	26·71
10. Superphosphate, 1 cwt., and nitrate of soda, ½ cwt.	48·80	..	30·09
11. Superphosphate, 1 cwt., nitrate of soda, ½ cwt., potash, ½ cwt.	49·24	..	28·44
12. Farmyard manure, 10 loads	45·72	..	24·98

The triennial averages are especially interesting, as they indicate the manurial treatment most likely to be successful on Wimmera soils. They show that by thorough cultivation, and even without the assistance of any fertiliser, yields of 19.32 bushels per acre have been obtained. By sowing 56 lbs. of superphosphate, worth 2s. 6d. per acre, an increase of 7½ bushels per acre is obtained, giving an extra profit of 27s. 6d. per acre over the unmanured plot, with wheat at 4s. per bushel. By increasing the dressing to 1 cwt. per acre, costing 5s., an extra 9½ bushels were obtained, the net profit in this case being 33s. per acre over the untreated plot.

Heavier dressings than 1 cwt. give greater yields, but the increases beyond 1 cwt. are not remunerative.

The results also indicate that lime gives little or no response on Wimmera soils for wheat. Dressings up to 5 cwt. per acre increase the yield, but the increase is insufficient to pay for the extra cost of the lime. Heavier dressings than 5 cwt. per acre depress the yield. This is in striking contrast to results obtained in the north-east, where the application of lime has resulted in substantial and profitable increases in yield.

Basic slag is apparently less efficient in the Wimmera than in any other part of the State. The marked superiority of superphosphate over basic slag at Longerenong is probably due to the relatively high lime content of the soil.

In common with tests at other centres, the application of nitrates and potash do not result in profitable increases. It is a fortunate circumstance for the Victorian farmer that even on the oldest cultivated wheat areas experiments show that costly nitrogenous and potassic manures, so indispensable in European farming, fail to elicit a material response from Victorian wheat soils.

It is interesting to note that the plot which gave the highest net profit per acre for the three years was treated with 1 cwt. of superphosphate. As the average amount of super. used in the wheat areas is between 60 and 70 lbs., the test suggests that if heavier dressings of this fertiliser were generally used a material increase in the wheat output might be expected.

TIME OF SOWING AND RATE OF SEEDING TESTS—WYUNA.

An illustration of the effect of early and late sowing and the rate of seeding on the yields of wheat in the Northern areas is afforded by the results of experiments conducted at the Wyuna State Farm in 1915. The variety of seed used was Federation, a wheat of moderate stooling powers, and in the tests quantities of seed varying from 30 to 120 lbs. per acre were sown early in May and in the middle of June. The results were as follow:—

EARLY SOWING (First Week in May).

	Bushels per acre.
Plot 1, 30 lbs. per acre	31·4
Plot 2, 45 lbs. per acre	34·5
Plot 3, 60 lbs. per acre	36·8
Plot 4, 75 lbs. per acre	35·8
Plot 5, 90 lbs. per acre	34·7
Plot 6, 120 lbs. per acre	33·2

LATE SOWING (Middle of June).

Plot 7, 30 lbs. per acre	28·8
Plot 8, 45 lbs. per acre	27·3
Plot 9, 60 lbs. per acre	31·9
Plot 10, 75 lbs. per acre	34·0
Plot 11, 90 lbs. per acre	35·3
Plot 12, 120 lbs. per acre	32·1

The season was very mild and favorable to crop growth, and the difference between the early and late sown crops was less marked than usual. The rainfall during the growing period was 12.75 inches. It will be seen that even in a favorable season early sowing has considerable advantages. The highest return from all plots—36.8 bushels per acre—was obtained by sowing at the rate of 60 lbs. per acre early. If heavier seedings are used the yields rapidly fall off. With the late-sown crop the maximum return was 35.3 bushels per acre, but to get this no less than 90 lbs. of seed had to be used. The early sown plots gave greater crop returns and required far less seed than the late-sown plots. Precisely similar results were obtained at other centres. The results also suggest the reason for increasing the rate of sowing towards the close of the seeding season.

VARIETY WHEAT TESTS—MALLEE.

Results of the variety wheat plots conducted by the Department of Agriculture in the north-western Mallee are to hand. The centres chosen were Ouyen and Cowangie. At Ouyen six varieties of wheat were tested side by side on the farm of Mr. H. W. Pickering. The results were as follow:—

	Bushels per acre.
Yandilla King	20
Gluyas	17
Federation	16½
Dart's Imperial	16
Viking	13½
Marshall's No. 3	13

At Cowangie the tests were carried out by Mr. H. F. Hecht, and seven varieties of wheat were tested. The results are as follow:—

	Per acre. bus.	lb.
Dart's Imperial	25	52
Yandilla King	23	10
Federation	23	4
Marshall's No. 3	22	29
Gluyas	20	23
Mac's White	19	22
Viking	16	21

Generally speaking, the late maturing varieties, such as Yandilla King, have done best at both centres, and this is doubtless due to the prolonged cool weather in spring and early summer favouring the development of these slow-growing types. It is interesting to note that Mac's White, one of the most popular varieties in the north-west Mallee, occupies a relatively low place on the list. Gluyas has done best of all the early maturing wheats, and at Ouyen its yield exceeded that of Federation. At both centres the yields of the early varieties were affected by a severe frost, followed by a hot wind. The rainfall during the growing period at Ouyen was 8.93 inches, and at Cowangie 10.32 inches. In both cases the plots were grown on land that had been cropped previously. The yields at both centres are a striking testimony of the fertility of the Mallee areas in a normal season.

(To be continued.)

AMERICANS AND FRUIT.

America is quite ahead in the matter of fruit eating. In fact, it consumes more fruit per head of population than any country in the world. This is due to several reasons—first, the progressive methods of advertising adopted by the various packing organizations; and, second, by the excellent manner in which the various cafés, restaurants, and other eating-houses display the fruit. On entering any of the ordinary eating-houses the first thing that attracts is a pyramid of beautiful apples arranged either on the counter or in some conspicuous position, also grape fruit, oranges, and other fruits. This excellent feature is noticeable in all the leading cities. San Francisco, Los Angeles, St. Louis, Chicago, &c. Fruit is placed under the attention of the public on every opportunity.—*Auckland Weekly News.*

A LESSON ON THE DROUGHT.

By B. A. Barr, Senior Dairy Supervisor.

If cows receive only sufficient fodder to keep them alive no return for the feed is received beyond the prospective value of the cattle, whereas, if sufficient is given to provide for milk production in addition to that required for maintenance, a profit over the cost of feed will be returned, provided always the cows possess milking capacity. The following case illustrates the value of feeding milking cows with a full ration, even at the high prices ruling for feed during the past drought. A herd of twenty-nine cows, including five heifers on first calf, and cows in all stages of lactation, each received as a daily ration:—

	s.	*d.*
8 lbs. straw chaff valued at £6 per ton cost ...	0	5.1
8 lbs. bran valued at £11 per ton cost	0	10.4
2 lbs. cocoanut oil cake valued at £12 per ton cost	0	2.6
Total cost for each cow	1	6

The return was as follows:—

Daily yield, 61 gallons at 1s. 3d. per gallon on railway station.

	s.	*d.*
Daily average return for each cow	2	7
Daily average cost of feed	1	6
Profit	1	1

The straw chaff was steamed, and had been on the farm for some years.

The farm was in a drought-stricken area, the paddocks were bare, and this return was received throughout the whole drought. If the milk had been used for butter-making a profit of 4d. per day would have been returned. Supposing the food provided had been reduced to an amount sufficient only to keep the cows alive, no profit would have been returned, but instead a charge for cost of feed would have to be made against the value of the stock.

The above ration is considered neither an ideal one, nor the most efficient, but it must be remembered that, at the time, drought conditions prevailed, and bulky feeds were particularly scarce. Under normal conditions, or when purchasing even in drought times, hay chaff at high rates would be preferable to straw.

SCIENCE and practice helped by experience—that is what we want. Experience means that which we have ourselves learnt; that which has been knocked into us so forcibly is never forgotten. This is why it is so often advocated that "every farmer should be his own experimenter."

THE WALNUT.

(Continued from page 747, Vol. XIII.)

C. F. Cole, Orchard Supervisor.

DISEASES (*concluded*).

BACTERIOSIS OR WALNUT BLIGHT.

Of all known diseases attacking the developing nuts of the walnut, bacteriosis is the worst that the grower has to contend with. The loss caused by this bacterial trouble is considerable, and has been mentioned in former articles (*vide Journal of Agriculture,* August, 1914, p. 460).

It is not definitely known how long this disease has been in Victoria. Mr. C. C. Brittlebank, Vegetable Pathologist to the Victorian Department of Agriculture, states that he saw walnut trees growing upon a farm in the year 1888 attacked. Mr. J. Farrell, Supervisor of Orchards, submitted in November, 1906, diseased walnuts from the Ardmona district to Mr. D. McAlpine, the Government Vegetable Pathologist, and he diagnosed the trouble as walnut bacteriosis. From inquiries made, several growers in the Bright and adjacent districts state that they have known the walnuts to be attacked from twelve to twenty years ago by a disease which they commonly termed black spot. There is no doubt that this black spot of twenty years ago is the bacterial disease of to-day. Up to the present in Victoria there is no record of the fungus disease (marsonia juglandis) appearing. This produces a similar condition to that of walnut bacteriosis.

From personal observations and the perusal of scientific works dealing with this disease, it is found to be more prevalent and virulent in localities where the weather conditions are moist and humid during the spring and early summer than in districts where such weather conditions do not prevail.

In Victoria the greatest quantity of walnuts is produced from trees growing in districts having a good annual rainfall and subject to moist atmospheric conditions in late spring. Therefore, the walnut crop is partly looked upon as a chance one, owing to the risk of attack by this bacterial organism.

During the month of November, 1913, in the Bright and adjacent districts the walnut crop looked promising until moist and humid conditions set in. By the end of the month the greater percentage of the developing nuts was attacked or destroyed by bacteriosis.

The following spring and early summer of season 1914 was one of the driest upon record in these districts. The walnut crop was almost entirely free from attack.

Trees that lost fully 75 per cent. of the crop through this trouble in the spring of 1913 were practically free from attack in the dry season of 1914.

OFFICIAL RECORD OF RAIN, BRIGHT DISTRICT, FOR THE LAST THREE MONTHS IN THE YEARS 1913-1914.

	Inches.	Points.
1913.		
October	4	31
November . .	2	98
December	1	07
1914.		
October	—	—
November .. .	1	98
December . ..	2	72

This shows that the development of this bacterial organism is influenced by the same atmospheric conditions as largely controls the development and growth of fungus diseases generally. Although prevalent in the walnut areas of the State, and commonly termed black spot, very few growers know that the actual cause of this walnut disease is

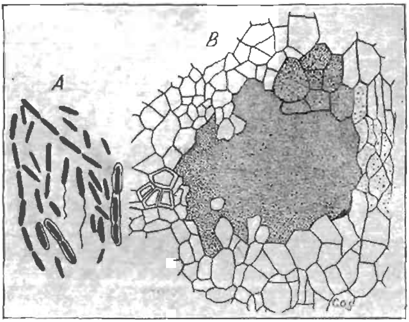


Fig. 32.—A. **Walnut Blight Organism** (Pseudomonas juglandis) **greatly enlarged. B. A mass of the bacteria in diseased walnut tissue. (After Smith, Bulletin No. 231).**

the workings of a bacterial germ. Bacteriosis of the walnut is a micro-organism, rod shaped, having rounded ends, and occurs as a single rod or often in pairs, and more rarely in chains of several individuals, commonly four to eight. An American authority gives the measurement of these rods as found in diseased tissue from 1.5 to 3.01 microns in length by 0.3 to 0.51 microns in width. A micron is the millionth part of a metre, or 1/25400 of an inch. (Plate 32.)

This blight organism is motile, *i.e.*, capable of spontaneous motion, increasing rapidly in number by elongation and division, or fission.

Walnut bacteriosis does not confine its attack solely to the developing nuts. It may occur upon all the tender, new, growing parts of the trees, such as young nuts, branches, and parts of the foliage. On the affected parts blackish-coloured areas, or pronounced lesions (wounds)

are produced. Vegetable pathologists state that this blackening is brought about by oxidation of the tannic acid in the tissue.

Very little having been done in Victoria with regard to the physiological and pathological characteristics of this disease, the following abridged extracts are from Bulletin No. 231, an American work already referred to, and are the results of exhaustive scientific experiments, both in the laboratory and field.

Cause of Disease.—This disease has been conclusively proved to be produced by a species of bacteria growing in the diseased parts. A microscopic examination of diseased tissue shows countless numbers of these small, rod-shaped organisms to be present. By employing bacteriological methods pure cultures of these germs were obtained, and then these pure cultures were used in making artificial inoculations into healthy nuts and shoots, thus again producing the disease by inoculations from the culture if the tissue was in an active growing condition. This disease causes very characteristic, comparatively small, sunken black areas on the small shoots of the trees. It does not attack branches of any size, and does not injure them to such an extent that they die back for several feet, as in the case of a trouble termed die back, which is principally caused through a dry subsoil, planting the trees too closely together, deficiency of plant food, and other causes. Although bacteriosis attacks the leaves, it does not cause defoliation of the trees, and if this disease did not attack the nuts would be of little economic importance. Young trees are much more free from bacteriosis than are those that have been in bearing for a longer time.

On Branches.—Bacteriosis is at first confined to small areas, but under favorable conditions these increase in size to a lesion or diseased area, extending 2 or 3 inches in length on the green shoot. The disease always has its beginning on the young succulent growth which may be near the growing end, or at any other point. When the disease infects a branch near its end, that part may be killed back, but this seldom occurs except when the diseased lesion is very near the end. In the worst diseased lesions the tissue is killed inwardly to the pith, while in less severe cases only the bark and wood are diseased. As the shoot becomes more woody it is more and more difficult to infect, and no tissue ever becomes affected after the first few months of its growth. The disease, after the first year, even in well-defined lesions, gradually dies out, and the tissue heals over the old lesion, although in some cases short lengths of the worst diseased shoots may die back for a few inches. The diseased portion on the twig at first forms a small, discoloured, or water-soaked area, which gradually increases in size, and at length the central portion becomes black, and is surrounded by a water-soaked margin, or fermentation zone. As the shoots become more and more woody, the active development of the disease is checked, and no further tissue is involved. Then the whole diseased area becomes blackened in colour. The diseased portion, in many cases, comes to have a somewhat shrunken, dried out, deformed, cracked condition, because of the killing and drying-out of the tissue. The diseased twigs of the previous year are without doubt the chief source of the initial infection each spring.

The catkins are probably not diseased by walnut bacteriosis; they often turn black, but this is probably only due to the natural process of

dying and drying up after their work is done. Various attempts have been made to obtain the blight organism from these darkened catkins, but without success.

Blossom End Infection.—While the nuts may be infected at any point in the surface, by far the most common, as well as most virulent form of infection is at the blossom end, near what is technically called the stigma. This is the weakest part of the nut, and is especially sensitive to the blight. The bacteriosis is very bad on the small nuts, and when once it has started at this point it rapidly continues its growth within the tissue, until the small nut is sufficiently weakened to fall. Not all the infected nuts fall when they are small, but some remain on even until harvest time. In the nuts the disease gradually grows within the tissue until the kernel is reached, which at length becomes blackened and then destroyed. The disease may start at any place on the nut, and gradually

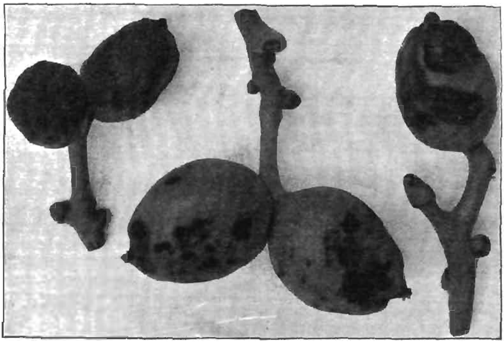


Fig. 33.—Developing walnuts attacked by bacteriosis—Bright district, 1913.

extend through other tissues into the kernel, but by far the most of the infections that injure the kernels are from the blossom end. (Plate 33.)

Lateral Nut Infection.—The disease on the nuts starts at one or more points on the surface as a small, circular, raised, discoloured area that at first has a water-soaked appearance, and may not be larger than the point or head of a pin when first visible. The diseased area in its earliest stages is slightly raised above the surrounding healthy tissue, but as the disease progresses the spot becomes more or less sunken below the normal tissue. The spot gradually enlarges in size, and becomes black in appearance. Surrounding the blackened area is a paler zone, having the same water-soaked appearance already referred to. This band of tissue lies between the healthy tissue and the blackened area, and represent the cells of the tissue that are being acted upon by the ferments secreted by the organism, which break down the tissue and

prepare the way for the further advance of the bacteria. In the early infections, if climatic conditions are favorable, lesions, or dark spots, are formed, which often extend through the hull and shell-forming tissues into the kernel. The nut in such cases is deformed in shape as the diseased part ceases to grow. Such nuts do not bark clean, as the outer covering clings very tightly to the shell, and the kernel at best is only poorly developed.

Late Infections.—It often happens that during the summer months weather conditions are favorable for natural infection of nuts. At this time the outer tissue is beginning to harden, and is not in condition for the deep growth of the disease that occurs earlier in the season, when the tissue is more tender. The parts of infection appear as small, dark-coloured areas scattered over the surface of the nut. Each little infection can be distinctly seen, or its confluence with others may make a large spot. In these late infections the development is shallow, and does not penetrate much through the epidermis, and the disease seems to dry out and die. Occasionally a more severe late infection occurs, where the blackening and lesion extend to the hard shell, causing the hull to cling to the shell of the nut.

White Deposit on Diseased Tissue.—On the surface of the diseased tissue of both the branches and the nuts can often be observed a whitish substance that accumulates during the summer, but at length disappears. When this is properly stained and examined with a compound microscope, it is found to be composed of countless numbers of bacteria and broken-down plant tissue.

Winter Habitat of Germ.—The germ of the organism, without question, winters in the old lesions of the branches. Much work has been done in making cultures at short intervals of time throughout the year from the different diseased tissues in order to see if the disease organism was alive, and where it best could pass through the winter, or dormant period. In every series of cultures the disease organism was found, showing conclusively that the disease was still alive in the old lesions of the wood and bark. The most prolific source of new infection is the lesions on diseased twigs. Here the germs remain in almost a dormant condition until the warm weather of spring, which arouses them to a renewed activity, when they exude on the surface, and are carried to the new growth, leaves, branches, and nuts. From observation, the young leaves seem to be infected very early, and probably are one of the chief sources of the secondary infection.

Secondary Infection.—The first, or initial infection, may occur on only a few nuts and new growth, then quite suddenly the disease seems to spread and infect many small nuts. This sudden increase of the disease is due to an infection from the earlier diseased nuts and new growth, and can thus be termed the secondary infection.

Effect of Climate.—This disease is quite susceptible to variation in climatic conditions. It is a matter of observation that the amount of disease varies from year to year in a given locality, also that some sections are freer from the disease than are others, even during the same period of time. A grove may be very bad one year, and nearly free from the disease the following year. The amount of moisture present in the air has, without question, considerable influence on the quantity

of disease that may develop, as humid conditions are especially favorable *for its spread.* It has been proved again and again by experiments that infection is produced when water containing the disease germs is sprayed on *the surface of the young nuts, while the untreated ones are free from* the disease. Then, for infection to take place under natural conditions, it only becomes necessary for virulent germs to come in contact with immature nuts, and water is apparently the principal agent in conveying the germs from the diseased lesions to the young growth or small nuts below. *Rains or fogs occurring in the spring, after the nuts appear,* particularly at night, are very favorable for the dissemination and new infection of the small nuts. During these conditions the trees become saturated, water dripping from one portion of the tree to another, which could easily carry the disease organisms to healthy tissue.

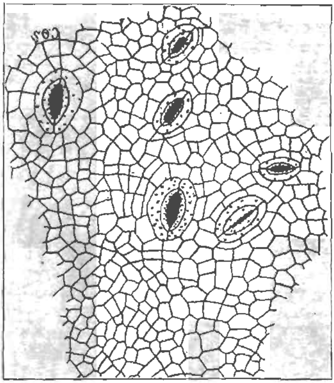


FIG. 34.—Section of surface of green walnut, showing a group of stomata through which the blight germs enter. Much enlarged. (After Smith, Bulletin 231.)

How the Germ Enters the Tissue.—Nuts, as well as the leaves and young shoots, are provided with stomata, or breathing pores, through the epidermis into the interior of the tissue. These stomata on the nuts *are arranged in groups of from five to a dozen or more,* and are to be found on the paler green specks that spot the surface of the husk of the green nuts. It is through these openings that the bacterial organism can gain entrance to the interior of the tissue of the young nuts. The blight organism being motile and when carried to the surface of the nut by moisture, such as fogs, heavy dew, and rain, can use this moist surface to swim directly into the stomata, or breathing pores, just described. When once in the interior of the nut, the conditions are

favorable for further development. While these stomata have the power to open and close, they are probably never so closely shut that the small germs could not enter. The moist conditions favorable for the entry of the germ, or bacterium, through the stoma are also just the conditions necessary for keeping this entrance open.

Non-blighting of Late Blooming Trees.—The majority of the bearing groves of California are at this time year 1908 seedling trees, differing greatly in their blooming periods. The difference in time is frequently from one to two months, and may be as much as three months between the earliest and the latest French varieties. Such a wide range in time of blooming gives considerable chance for difference in climatic conditions. We find that the early or medium blooming trees are in blossom at a favorable period for the blight to develop, while the late bloomers come into flower at a time when bacteriosis can make little headway. Particular attention has been given to this phase of our investigation, in the hope of finding a commercially profitable tree that blooms at a season when conditions for the infection of the small nuts is at a minimum. While this work is not yet completed, enough has been done to show that nuts in such late trees are comparatively free from the disease.*

Immunity.—Certain trees are some times spoken of as being immune to the blight, but while there is probably no such thing among walnuts as absolute freedom from this disease, where conditions are favorable for blight infection, yet some trees do show quite a marked resistance, and, if otherwise desirable, are given precedence in new plantings on this account (variety Eureka, for instance). It may be that in certain localities there is no blight, but this probably is not due to any immunity that the trees possess, but is rather the effect of climatic conditions, or due to the fact that the specific organism has not yet reached this particular locality.†

Spraying to Control Bacteriosis.—American experiments.—In the spring of 1906, several large blocks of good-sized seedling trees were selected for this purpose in the vicinity of Whittier, and spraying operations were commenced. The principle experiments were made with three different fungicides—Bordeaux mixture, lime-sulphur, and a sulphur spray made by boiling together sulphur and caustic potash. The work was done with a power sprayer, and was carried on more thoroughly and carefully than any grower would be likely to do such spraying, and without regard to expense. In one instance a large block of trees was sprayed with Bordeaux mixture, using a 5.6.50 formula; in another, a heavy lime-sulphur was used, the spray being prepared by boiling; while in the third the potash-sulphur spray mentioned above was used. It was found in all this work that to spray large walnut trees thoroughly is an extremely slow, difficult, and expensive operation. As a result of this experience we were led very soon to believe that the general spraying

* Probably this lateness in blooming is responsible where trees are found reasonably free from attack, and growing adjacent to those very susceptible. The majority of walnut trees in Victoria originated from non-selected seedling trees, and start to bloom early, from the latter end of September and during October. Any trees found blooming towards the end of October and early November should be comparatively free from this disease. If this lateness of blooming is an important factor such trees should be kept under observation by the grower, and compared with the early bloomers.—AUTHOR.

† No doubt these conditions are responsible for the immunity of trees growing in certain localities in Victoria.—AUTHOR.

of Californian walnut groves would be extremely difficult, if not absolutely impossible, for the average grower to get the work done thoroughly enough, even though the spraying done by ourselves should prove extremely effective in controlling the disease. During the summer following our sprayings careful observations were made from time to time of the conditions as to blight of the sprayed and unsprayed trees in the experimental orchards. From such observations no difference whatever in the prevalence of the disease on the nuts could be detected. Many of the sprayed trees lost a large portion of their crop from bacteriosis, and even on individual, rather small trees, or individual branches which had been especially well sprayed, and absolutely covered with the mixture, much blight developed on the nuts, and it soon became apparent that no satisfactory degree of control, if any, had been secured by our work. During the following year, 1907, the appearance of the trees sprayed in 1906 gave some reason to believe that the disease was less prevalent on the sprayed than on the unsprayed trees. This was particularly true in the case of trees sprayed with lime-sulphur. It is, therefore, not improbable that while infection of the nuts during the year when the spraying was done was not prevented, that the shoot and twig infection was somewhat controlled, and that on this account less blight was carried over winter, and less nut infection took place the following year. From the experiments, we became thoroughly convinced that the possibilities of walnut bacteriosis control did not lie in the direction of spraying.*

* The results of spraying in Victoria gave no satisfaction as regards controlling this disease. Furthermore, it is not a practicable proposition owing to the size the trees attain under favorable conditions.—AUTHOR.

NITROGENOUS NODULES.

The majority of plants do not have root nodules, as, for example, the cereals, potatoes, and the like. The nitrogenic nodules are produced by micro-organisms closely related to the bacteria, which make their entrance from the soil through the tender walls of the younger portions of the roots, and induce a cell growth in the region of the invasion that results in a nodule, which is able to lay hold and adapt the free nitrogen of the atmosphere for the use of the plant. To a certain extent the number and size of the nodules may be taken as an index of the success of the plant. Soil from an old pea field will produce nodules upon pea roots in new land better than upon clover or any other crop. This leads to the subject of soil inoculation. Successful experiments have been made in soil inoculation with crimson clover and hairy vetch. Soil from old pea land has made a striking difference when spread upon other soil, and the larger growth and deeper green colour of the pea plants. Soil in which peas were grown in one district has been brought to another for inoculation, and the nodules formed in this mixture were afterwards used to inoculate other soils. Besides this also the growth of leguminous plants in rotation with cereal crops fulfils another important function in the promotion of humus on the surface soils.

THE PRACTICAL ECONOMY OF SKIM MILK.

By J. M. Kerr, Senior Dairy Supervisor.

Every gallon of cream sold, leaves on the farm about nine times its own bulk of separated milk to be turned to other account. The use to which skim milk is most commonly put is conversion into bacon by feeding to pigs; but it is rare indeed to find it being used as economically as it might be in the process. This is mainly due to a defective understanding of its limitations, in which case the discredit which is so often visited on the skim milk should really attach to its owner. Properly understood, and properly utilized, skim milk has a value which no ordinary dairyman can afford to despise.

Where Fat's Common Virtue does not Apply.

In utilizing skim milk, it should never be forgotten that the natural fat is missing, and that, in consequence, skim milk alone is a one-sided food for any animal. As it happens, skim milk retains the most valuable food ingredients, the loss of fat notwithstanding. From the bacon-curer's point of view, fat is the ingredient which can best be spared. In animal nutrition, fat shares with starch the function of generating the requisite heat and energy, though of the two, fat is much the more efficient for the purpose. This gives fat a very high value in most feeding operations, but feeding for bacon production is the exception.

An animal warmly-kept, and at rest—as a fattening pig should be—need consume but little heat-producing (carbohydrate) ingredient to satisfy all its needs in that particular direction. If these needs be much exceeded, nature, being unable to utilize the surplus heat and energy, conserves them in the system, in the form of fatty tissue, to a degree inconsistent with the popular taste in bacon. It not only means an excessive proportion of fat to lean, but, if the diet be too fatty, the bacon so produced is poor also in colour, flavour, and keeping quality. For this reason, the heat and energy supply of a pig may well be entrusted to the less active carbohydrate—starch—a food ingredient which exists to superfluous extent in most foodstuffs commonly available on the farm.

Skim Milk an Unbalanced Ration.

A food to be complete must possess two distinct groups of ingredients One group is represented by fat and starch, which have a common function—which, in the case of a restful, comfortable pig, might be called fat formation; the other is protein, which has a different function, *viz.*, mainly flesh formation. In a perfectly-balanced diet, these two classes of food must exist in a certain ratio to one another—the nutritive ratio. Any departure from this relation, one way or the other, is a detriment. As the solid portion of whole milk contains the respective food groups in just ideal proportion for a growing animal, neither part can be depleted without leaving the other superabundant in consequence. It is because the butter-fat is missing that the remaining solids contain such a high percentage of protein—in fact too much protein.

The High Protein Content Particularly Valuable.

This is a rare virtue in foodstuffs, and the dairy farmer who fails to appreciate its significance in animal feeding does not know his business.

The man who knows what protein means to a ration also knows *the difficulty of procuring it in adequate quantity. No doubt the* water, existing in such quantity as it does in skim milk, is rather a debaser—in cold weather, at all events; but the man who would complain of the excess of protein is surely suffering from an embarrassment of riches.

Protein, and particularly digestible protein, is the ingredient in which nearly all the common home-grown foodstuffs of the farm are more or less deficient, and it is really the chronic want of a sufficiency of it which generally embarrasses dairy farmers in all their animal-feeding operations—if they only knew it. It is just here where skim milk, with its more than enough protein, can be put to its utmost practical use. Skim milk contains practically all the natural protein of the milk, as well as the milk-sugar and mineral matter. Just as protein is indispensable for flesh formation, mineral matter is equally so for bone formation. These two formations—flesh and bone—constitute real growth in the animal, as distinct from the mere accumulation of fatty tissue. It should be every bacon-producer's care to so feed his animals that fat formation waits on flesh formation, and good bacon on both. This cannot be accomplished without adequate protein and mineral matter—the peculiar virtue of skim milk.

In no other food in nature does either protein or mineral matter occur as assimilable and as palatable as in the curd and ash respectively of milk—either whole or skimmed. In having a feeding material of such nature daily to his hand, the dairy farmer is certainly in a favoured position as a producer of prime bacon. It calls, however, for proper use, viz., that of balancing other fodders not so plentifully endowed with precious protein.

EXCESS OF ANY CONSTITUENT MEANS DEFICIENT CONSUMPTION OF ANOTHER.

The mere presence of protein, fat, starch, and mineral matter in a food is not enough—a further necessity is that they be present in proper proportion. Skim milk's one-sidedness is due to its excessive protein-*content and the comparative deficiency of carbohydrate;* but another imperfection which must also be allowed for is the water content—superabundant, yet dissociable—which unduly adds to the bulk.

If skim milk alone be the pig's portion, his stomach becomes fully distended long before he has acquired a sufficiency of starchy ingredient. Over-gorging is the only alternative to going deficient—neither of which is ever associated with maximum returns. Some farmers foolishly think that, by souring the milk and discarding the whey, they are getting rid of the surplus water only. This is a serious mistake, because the water removed in this way takes along with it the milk-sugar—the starchy ingredient in which the skim milk is already deficient.

THE RATIONAL METHOD OF BALANCING BY ADDITION.

Extraction of the surplus water is not commercially practicable, and would be folly to attempt, seeing that the same desired effect can be arrived at by supplementing the milk with other foodstuffs over-rich in starch (to balance the surplus protein of the milk solids) and as free from water as possible (to balance the excessive water-content of the milk). The ideal "thickening," therefore, for skim milk, should be the

more starchy and dryer grain concentrates, viz., maize, wheat, barley, &c., and pollard, which, though fattening in themselves, have a higher proportion of starch to protein than is required, and only need a little more of the latter to make them about all that a pig requires in the way of food—that is, if adequate water is also provided. Skim milk is admirably adapted to supply the little which grain lacks; and, because the deficiency is little, it can be fully met by an amount of skim milk not beyond the pig's capacity to absorb. If any more than 3 lbs. of skim milk is fed to each pound of grain, the farmer may depend that the pig's progress is being hampered for want of sufficient starch. This ratio should never be exceeded, even in a young, growing pig, in which the demand for protein and mineral is much greater than in an older one. As the pig develops to full size, the proteid skim milk should be still further reduced, even eventually down to the pound-to-pound ratio. Provided normal prices prevail, the pig will repay with interest every pound of pollard so used.

The Advantage Proved.

So far, we have the theory, but it does not stop at that. We have the experience of many of our most successful pig fatteners, as well as the authority of leading experimentalists, to show that it is borne out in practice. The experiments about to be quoted speak in pounds, but most pig feeders are not exact enough in their practice of mixing foods to be able to say what weight of each foodstuff their pigs receive. It is safe, however, to accuse the majority of never adding as much as a bucketful of pollard to a bucket of skim milk. Yet this is not enough pollard—it is but 1 pound in 4. The pig's needs call for never less than 1 pound in 3.

The Superiority of the Higher Proportion of Grain.

The mutually economizing effect of grainstuffs and skim milk, when fed to the same animal in proper proportion, may be realized by a study of the following figures—the results of various experiments by Professor Henry.

To fully appreciate them, it should be understood that, when pigs received grain alone, about 500 lbs. is required to increase their weights 100 lbs.; and that about 3,000 lbs. of skim milk, if fed alone, will accomplish the same increase. The following oft-quoted table (from *Henry's Feeds and Feeding*) shows the respective quantities of skim milk and corn (maize) meal required to increase the weight of pigs 100 lbs., according as the milk is supplemented in greater or less proportion.

When fed	Feed for 100 lbs. of gain.	
	Meal.	Skim Milk.
	lbs.	lbs.
1 lb. of maize meal and 1—3 lbs. of skim milk ..	321	585
1 lb. of maize meal and 3—5 lbs. of skim milk ..	265	1,048
1 lb. of maize meal and 5—7 lbs. of skim milk ..	250	1,434
1 lb. of maize meal and 7—9 lbs. of skim milk ..	207	1,616

The most effective proportion is here proved to be the 1 to 3, when 321 lbs. of corn and 585 lbs. of skim milk produced the 100 lbs. of gain. Had the pigs been confined to the 321 lbs. of grain, the increase (allowing 500 lbs. for 100 lbs. of gain) would be 60 lbs. If limited to the 585 lbs. of skim milk alone, 19½ lbs. of gain might be expected. Fed in this way, the total production is 79½ lbs. Yet these same amounts, when the pigs were allowed to receive both meal and milk, produced 100 lbs.—a 20-lb. greater return without any extra cost. The improved result should be the common experience of every bacon producer who is fortunate enough to have skim milk, and none should be satisfied with less.

THE ENHANCEMENT EFFECTED BY PROPER ADMIXTURE.

A farmer content to use bare milk gets, from 585 lbs. of skim milk, *a return of about 14½ lbs. of carcass bacon, which, at 4d. a lb., is worth* 4s. 10d.; while another farmer believing in copious pollard can get back all the pollard cost and a further 9s. from the same quantity of skim milk. By spending 16s. for 16 bushels of pollard, to supplement the 585 lbs. of skim milk, 75 lbs., or £1 5s., worth of carcass bacon is produced, instead of the 14½ lbs. which might be expected from bare milk. Deducting the 16s. for pollard leaves 9s. clear to compare with his sceptical neighbour's 4s. 10d. To get the increased turnover, with its gross money return of £1 5s. instead of 4s. 10d., the farmer certainly had first to lay out 16s. The man who is not willing to spend this is practically accepting 4s. 10d. in preference to 9s.

WHAT IS LOST BY NOT GOING FAR ENOUGH.

So far, the comparison has been between the man who uses no concentrate and the man who uses it as liberally as it should be used. How does the man fare financially who believes in "some" concentrate only? His ratio is most probably represented in the third experiment in the above table. Here the pigs were fed 250 lbs. of concentrate, along with 1,434 lbs. of skim milk—about 1 in 6. The gain was the same, 100 lbs., or 75 lbs. of carcass bacon. Therefore, 585 lbs. of milk—the amount used in the best-balanced experiment—and 102 lbs. of concentrate, the same ratio, would produce 30½ lbs., or 10s. 2d. worth of bacon. From this, 5s. 1d. must be deducted for the 102 lbs. of pollard. The result is 5s. 1d. clear. The additional value imparted to skim milk, by proper balancing, is summarized in the following:—

Milk.	Pollard.	Bacon Produced.	Value.	Cost of Pollard.	Profit.	Return per Gallon.
585 lbs.	nil	14½ lbs.	4s. 10d.	nil	4s. 10d.	1d.
585 lbs.	102 lbs.	30½ lbs.	10s. 2d.	5s. 1d.	5s. 1d.	1.04d.
585 lbs.	321 lbs.	75 lbs.	£1 5s.	16s.	9s.	1.85d.

"LOSING THE SHIP FOR A HAPORTH O' TAR."

By laying out 5s. 1d. where he should lay out 16s., a man gets only 5s. 1d. for every 585 lbs. of skim milk (equal to 1d. a gallon) instead of 9s. (nearly 2d. a gallon). Thus 58½ gallons of skim milk may return 5s. 1d., or 9s., just according to the business capacity of the man who has the disposal of it. No doubt, the man who gets the former return thinks he saves money by his more "careful" use of pollard. He does save 10s. 11d. *on the pollard, and receives 14s. 10d. less for bacon*

every time he does it This loss of nearly 4s. occurs with a small quantity of milk like 58½ gallons. How many Victorian dairy farmers are suffering it many times over every day of their lives?

[Pollard has been substituted for the maize of the American experiment, because in normal times prices are always in its favour here.]

The better returns when the proportion of pollard is kept up to one-third should convince any one that full supplementation of the skim milk is worth while, despite the indifference of so many dairy farmers.

Of course, it is not meant to suggest that a certain exact proportion is to be adhered to absolutely in the practical operation of pig feeding—a slight variation one way or the other is neither here nor there. What is urged is that the man with skim milk to utilize should keep somewhere near the proportion which has been proved by frequent experiment to be the most effective. It means raking in an extra 1d. for every gallon of skim milk which he is fortunate enough to possess. It may be seen from the above how the skim milk of one cow—say 585 gallons—may be worth £2 8s. 4d. to one man, and £4 10s. to another, just according to the business grasp of the owner; also, why farmers' estimates of the gallon value of skim milk vary so.

NO NEED TO GO BEYOND POLLARD.

The inducement to use concentrate in pig feeding is naturally in proportion to the net return possible from such use, and this in turn must depend on the market price of concentrates. Unless grain seconds are available instead, it is unlikely that, as a concentrate, pollard can be improved upon for the purpose; but, of course, the market price is the determining factor here. Though maize-meal, barley, rye, peas, wheat, and pollard, &c., are all nearly equally effective in fattening, it perhaps never occurs that they can be equally recommended for the purpose, because the respective prices must be considered; and the comparatively high prices which generally prevail in Victoria for most of the concentrates are a more or less constant bar to their general use as pig food. But pollard is usually a happy exception, although it is easily conceivable that beyond a certain price—as during the recent scarcity—it also would fail to be remunerative, unless the price obtainable for the fattened product should immediately adapt itself to the increased cost of production. With normal prices ruling for both pollard and bacon, a liberal use of the former with skim milk will undoubtedly justify itself, and prove a profitable venture. The other concentrates named can only be recommended in preference to pollard when their price is below normal, excepting, of course, when a man has "seconds" on hand which are not saleable. The addition of some coarser grain, however, facilitates the digestion of pollard.

WHY DO FARMERS HESITATE?

Dairymen generally do not doubt the efficiency of added pollard as an aid to fattening, and it is pleasing to admit that some supplementation of skim milk is general. The pity is that so many baulk at the quantity necessary for maximum results. A decision to purchase the requisite pollard, or to hold back more home-grown grain, requires confidence of a kind, rare amongst farmers, in the pig's ability to repay. The former means letting hard-earned cash out of hand, and the latter

means delaying the full realization of a year's labour, with an element of risk thrown in. Rather are they disposed to say, "It is not good enough risking hard cash on pigs." This is the error, and this the attitude which calls for combat. Such reasoners do not recognise the fact that, without a liberal use of concentrate, maximum profits from skim milk are impossible. Sometimes, of course, his financial position gives a farmer no alternative but to choose the cash-in-hand policy, and he may be a good business farmer, nevertheless—the suit has to be cut according to the cloth. But, if doubting dairy farmers, not financially restricted, will ponder what has been demonstrated by the above experiments—the reliability of which cannot reasonably be questioned—they might be induced thereby to entrust a short-dated loan to their pigs at the high interest there shown. The security may not be gilt-edged, but with pollard at 1s. per bushel, and bacon at 4d. per lb.—a very reasonable estimate—it is just as secure as that offered by committing bushels of seed oats to the weather in anticipation of a harvest. While bacon holds above 4d., and while the price of pollard, maize, barley, peas, wheat, &c., does not exceed ¾d. per lb., a man is commercially short-sighted who does not supplement his skim milk with all the concentrate which it requires, *i.e.*, never less than 1 lb. of concentrate to each 3 lbs. of skim milk which the pig receives.

In the light of the experiments shown above, only one conclusion is possible, viz., if it pays to use concentrate with skim milk at all, it is best to use it in the most economical proportion; and when it ceases to pay in this proportion, it does not pay to use it at all. The practice of "some" concentrate is too indefinite, and is merely groping in the dark. A closer observance of the recommended proportion might make all the difference between failure and success in pig fattening.

Of course, it is not all. As it is only the food eaten which gives results, the farmer should make it his policy to encourage the highest consumption, without entailing gorging. This can only be achieved by frequency, regularity, and punctuality of supply in the troughs—five times a day for preference. But, even with all the other essentials—healthy animals of the right class, comfortably and cleanly kept, sufficiently, frequently, and regularly fed on skim milk and concentrate—the maximum profits from skim milk will ever remain out of reach if the supplementing concentrate be used too sparingly.

Summed up, the significance of the figures quoted is as follows:—

1. That the addition of concentrate in the larger quantity greatly increases the efficiency of skim milk.

2. That the amount of concentrate commonly used with skim milk is altogether inadequate for maximum returns—consequently is uneconomical.

3. That 6 lbs. of skim milk is sometimes, and 5½ lbs. frequently, spent in doing what 3¼ lbs. should do.

4. That the returns possible from skim milk are much higher than are generally obtained from it.

5. That skim milk used with concentrate, never in greater ratio than 3 lbs. to 1 lb., returns, in normal times, perhaps 2d. per gallon; whereas, if supplied in 9 to 1 proportion, the probable return is only 1d. per gallon.

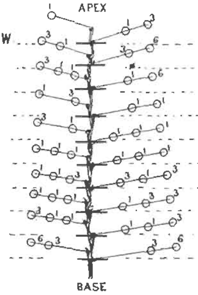
The moral is, "Use plenty concentrate."

VARIATIONS IN THE PLANTS FROM THE SAME HEAD OF WHEAT.

By Alfred J. Ewart, D.Sc., Ph.D., &c., Government Botanist of Victoria, and Professor of Botany and Plant Physiology in the Melbourne University.

In 1914, Mr. Adcock drew my attention to the fact that Mr. Whelan, at Rutherglen, had observed variations in the rate of germination of grains from the same head of wheat, the more rapid germination appearing to be shown by the grains from the middle of the head. Taking single grains, however, the rate of germination appeared to fluctuate so much at different parts of the head as to render it doubtful whether the variation was real or apparent only.

AVERAGE RATE OF GERMINATION



	I. GRAINS FROM SINGLE HEAD	II. FROM SEVERAL HEADS
1ST ROW	3 5	2.55
2ND „	2 5	2.37
3RD „	1.6	2.0
4TH „	1 5	1.37
5TH „	2.0	1.7
6TH „	1.0	1.0
7TH „	2 16	2.08
8TH „	2.75	2.17
9TH „	1.6	2.66
10TH „	2.8	3.65

Accordingly, tests were carried out at the University under fully controlled conditions in a large wire cage used for wheat breeding. Two diagrams were made on paper corresponding to each wheat head used. The grains were removed singly and planted an inch deep with the aid of a marker. The times of germination in days were marked on the duplicate diagram, those first to germinate being marked 1, those germinating three days later 3, and so on. The grains in each successive pair of right and left spikelets were marked 1st row, 2nd row, 3rd row, &c. The total germination figures were divided by the number of grains in each row. A diagram showing the germination figures for a single head is shown (Fig. 1), and also the germination averages for successive rows of a single head. (Column 1 of table.)

These show a considerable amount of irregular variation, but if the results from more than one head are averaged (Column II.), it can be clearly seen that the germination is most rapid in the grains of the

sixth row from the top, and that the average rate of germination decreases towards base and apex of the head. It is worthy of note that in planting out the grains in plots, none should be planted at all close to the edge of the plots, otherwise an increased delay of germination may be shown by such grains, which is due to physical causes unconnected with differences in the grains themselves.

The heads used were from a second generation cross of Federation ♂ X Bayah ♀. When the grain was ripe, the plots (thirteen in all) were examined for signs of individual variation in plants from the same head. There were no noticeable differences in the straw, flag, or in the basal parts of the heads. The tips of the heads varied, however, from somewhat tapering ends with a few distant sterile spikelets to blunter ends tipped with awns up to 1¼ inches long. The majority of the heads were awnless, the ratio being not in a simple Mendelian one, but very nearly in the proportion of 5:1. In three out of thirteen plots every head was awnless. In seven plots the longest awn at the tip of the head did not exceed ½-inch, and the awns were confined to the extreme tip or upper third of the head. In the remaining three plots, odd plants from various parts of the head developed awns up to 1¼ inches long, becoming shorter basally, and being always absent in the lower half of the head. All gradations between these extremes were shown, and, in addition, a similar but less pronounced range of variation was even shown in a few cases between heads stooled from the same grain.

Apparently, in this case the awned and awnless characters are not sharply defined morphological units capable of simple Mendelian inheritance, but are capable of an indefinite range of variation without any distinct line of demarcation, except such as may be made by an observer working upon a preconceived idea. In any case, it may be worth while to test the exact hereditary transmission of the awned and awnless characters more fully in a variety of cases.

POTASH FROM SEA-WEED.

The United States Department of Agriculture has made a thorough inquiry into the possibility of using seaweed as a source of potash for the purposes of cultivation. It is known that some of the seaweeds are rich in potash. Macrocystis contains about 2½ per cent., and therefore the main question to be resolved is the cost of production. By the introduction of a machine, run on the principles of a harvester, the kelp is harvested in barges at a cost of half a dollar a raw ton. Drying in hot-air ovens is estimated to cost a dollar per dry ton. When dry the kelp is brittle, and may be ground readily. From 1,000 tons of wet kelp 86 tons of dry kelp are obtainable, and this contains 16 tons of potash, and a ton and three-quarters of nitrogen. If mixed with fish-waste manure, it becomes, by the addition of phosphorus from the latter, a "perfect" artificial manure. Estimates of cost and price obtainable indicate that there is a fair margin for profit.

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Government Apiculturist.

XXVI.—THE HONEY FLORA OF VICTORIA—*continued.*

(Continued from page 674, Vol. XIII.)

THE BUTT-BUTT (*Eucalyptus Bridgesiana,* R. T. Baker).

Fig. 40.

This eucalypt was formerly considered to be identical with, or a variety of, the Apple Gum (*Eucalyptus Stuartiana*). It is, however, now classed as a distinct species. It differs from *E. Stuartiana* in generally having much longer leaves, less flowers in a cluster, a whitish-grey box-like bark, instead of a red stringy bark, and a whitish-brown instead of a red-coloured timber.

It is a tree of considerable size, with a whitish-grey wrinkled, or checkered, bark, short and brittle in the grain, not fibrous, and almost identical with that of the Boxes. The bark, when freshly cut, exhales an aroma similar to the ordinary eucalyptus oil.

The sucker leaves (1, 2, 3, Fig. 40) are, in the early stage, egg heart-shaped, and then pointed egg-shaped, on stalks or stalklets opposite or alternate. The mature leaves have rather long stalks, are pointed, lance-shaped, often somewhat curved, and vary in length to over 12 inches. The leaves are not shining, the lateral veins spreading, either prominent or faint; the marginal vein well removed from the edge; the clusters on flattened stalklets carry about seven flowers; the lower half of the bud is half egg-shaped, the lid half-round, blunt or pointed. The fruit is half-round, rarely conical, on a short stalk; the rim is thickened with a ring below the edge.

The timber is fairly hard, and whitish-brown in colour. It is only good for indoor work, as it decays rapidly when exposed to the air or placed in the ground. The Butt-Butt is found in Victoria in Gippsland and parts of the north-east. (Description and illustration (Fig. 40) taken from Baker and Smith's Research on the Eucalypts.)

THE PEPPERMINT GUM (*Eucalyptus piperita,* Smith).

Fig. 41.

A tall tree, with a trunk up to 4 feet in diameter. Stem and branches covered with fibrous bark, rough and grey outside. The branchlets are slender; the leaves scattered, sickle-lance-shaped, not very long, more shining on the upper than the lower side, dark green, and usually thin; their lateral veins faint and numerous; the marginal vein somewhat removed from the edge. The umbels of from five to fifteen, rarely three to four flowers occur at the shoulders of leaves, or mostly lateral on the branchlets, on slender, slightly compressed stalks; buds on short stalklets; lower part of bud half egg-shaped, top broad, conical, pointed;

fruits usually small, globular, egg-shaped, three- or, much oftener, four-celled; fruits occasionally larger and less roundish than those shown in the illustration. (Fig. 41.)

This tree is closely allied to the Blackbutt (*E. pilularis*), the White Stringybark (*E. eugenioides*), and to the Messmate (*E. obliqua*), as well

Fig. 40.—The Butt Butt (*Eucalyptus Bridgesiana*, R. T. Baker.)

[From R. T. Baker and H. G. Smith, "Research on the Eucalyptus, &c."]

as the Brown Messmate (*E. haemastoma*); and these different species are sometimes not readily distinguished from one another. The Peppermint Gum differs from the Blackbutt (*E. pilularis*) chiefly in its rough bark extending to the branches (which in the Blackbutt are smooth), in more slender and less angular branchlets, and smaller flowers.

From the White Stringybark (*E. eugenioides*), which was considered by Bentham to be a variety of the former, it is not easily distinguished, but its seedlings are smooth, while those of *E. eugenioides* are hairy (as shown in the background of the illustration). (Fig. 41.) The Messmate (*E. obliqua*) is distinguishable from the Peppermint Gum (*E. piperita*) by the larger and thicker leaves of the former, which are of

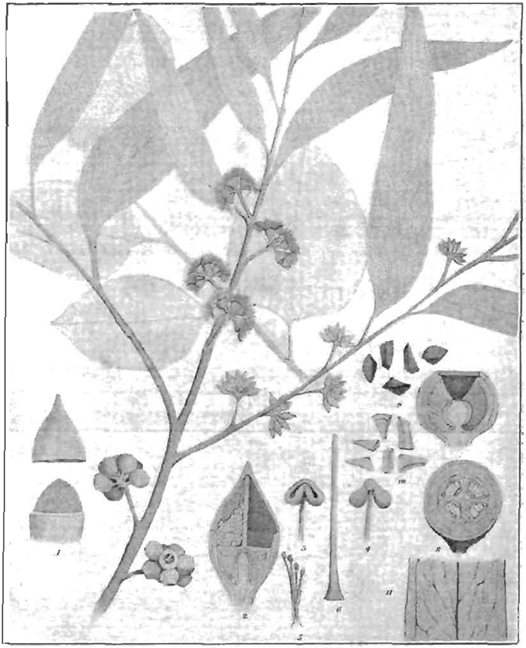


Fig. 41.—**The Peppermint Gum** (*Eucalyptus piperita*, Smith).

equal colour and shining on both sides, by the shorter and rounded blunt lid of the bud, and its longer conical lower part, or tube.

The distinguishing features of each species will become apparent on reference to the respective illustrations (viz., Figs. 41, 27, 15, 18, and 42).

The Peppermint Gum is found on less fertile areas, from the coast to the mountain region, occurring even on sand lands in Gippsland and New South Wales.

The timber is useful for posts and shingles, but inferior to that of the allied species previously referred to.

Of its value as a nectar-producing tree nothing can be said till its identity is established in districts from which information is available, but which may refer to one or other of the allied species.

THE BROWN MESSMATE (*Eucalyptus hæmastoma,* Smith).

Fig. 42.

Finally, a tall tree, with frequently quite smooth bark, or less usually persistent on the stem, but on the branches smooth to a great extent; it occurs, however, also occasionally with bark persisting up to the last branches, and would then come under the category of stringybarks, while in the ordinary form, with persistent bark on the trunk and smooth branches, it is apt, when judged by general appearance, to be mistaken for Blackbutt (*E. pilularis*), and passes under the latter and several other misleading local names.

The leaves are scattered on the branchlets, lance-sickle shaped, occasionally much narrower, but exceptionally also verging into a somewhat oval form, shining and of equal green on both sides, the veins running more with, than across, the leaf; the marginal vein somewhat removed from the edge. The umbels are mostly solitary, at shoulders of leaves, or lateral on branchlets or some in a short spray on angular and often somewhat compressed stalks, with from five to ten or rarely more flowers in each umbel. Tube of calyx (flower cup) broadly conical, about twice as long as the half-round depressed or slightly pointed small lid of the bud; the tube is not angular, and tapers into a somewhat long stalklet. Fruit half egg-shaped, with a rim of brownish-red colour, from which the species derives its systematic name, it is four, or less frequently, five-celled, the rim depressed or quite flat; valves very short.

The wood is not of any great value, not being durable, but it furnishes fair fuel. In Victoria the Brown Messmate is found in the eastern part of the State.

As closely-allied species sometimes differ considerably in the character and value of the honey produced from the nectar of their flowers, as, for instance, in the case of Yellow Box (*E. melliodora*) and Red Box (*E. polyanthemos*), what has been said in regard to Messmate Honey (*E. obliqua*), Fig. 15 (*Journal of Agriculture,* March, 1915), cannot be applied to the Brown Messmate (*E. hæmastoma*) without verification.

As to the time and frequency of flowering, and the length of time in bud of this and the two preceding species, nothing is yet known, and the writer would be grateful to get into communication with beekeepers and others interested in the Eucalypts who are able to give information, so that further and more complete data of the flowering habits of our Eucalypts may be available for publication.

THE SANDAL GUM (*Eucalyptus santalifolia,* F. v. M).

Fig. 43.

A tall shrub, flowering, however, already at a height of 5 feet. In sandy desert country, as also in scrubby valleys or on arid ridges, restricted to regions near the coast, and occurring in Victoria in the Portland district.

Fig. 42.—**The Brown Messmate** (*Eucalyptus haemastoma,* Smith).

Leaves scattered on firm angular branchlets, thick, narrow or rarely broad-lance shaped, almost straight or somewhat curved, of equal colour and shining on both sides on moderate or short stalks; veins very faint, almost obliterated, marginal vein somewhat distant from the edge of

the leaf. The specific name was devised by some resemblance of the leaves to those of sandalwood. The umbels occur singly at shoulders of leaves, but later lateral containing three to five, or rarely six to eight, flowers; stalks of umbels scarcely or somewhat angular, the stalklets of buds and flowers extremely short or almost none; tube of flower

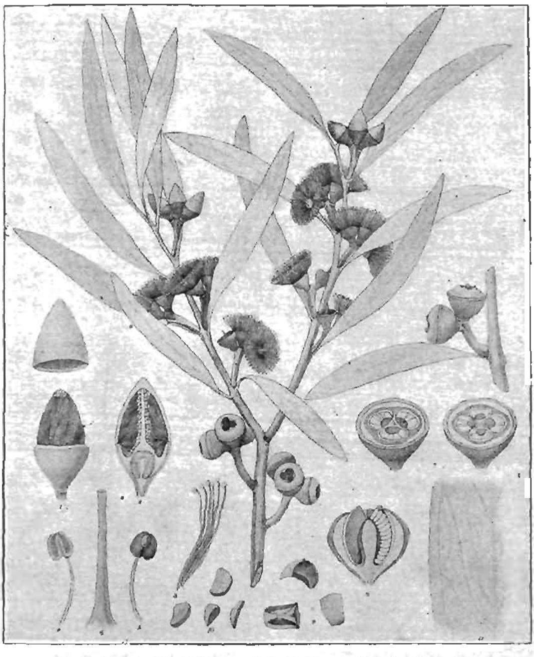


Fig. 43.—The Sandal Gum (*Eucalyptus santalifolia*, F. v. M.)

cup nearly half round and somewhat shorter than the half egg-shaped conical upper part of the bud; fruits depressed globular, three to four, occasionally five, celled. The Sandal Gum resembles the Brown Stringybark in the almost total absence of flower stalklets, but it does not attain the size of a large tree; the leaves are smaller, more rigid, of a lighter

green, less conspicuously veined, and not so unevensided. The flowers are generally less numerous on each stalk, and the fruits usually smaller. The Sandal Gum is a good oil yielder.

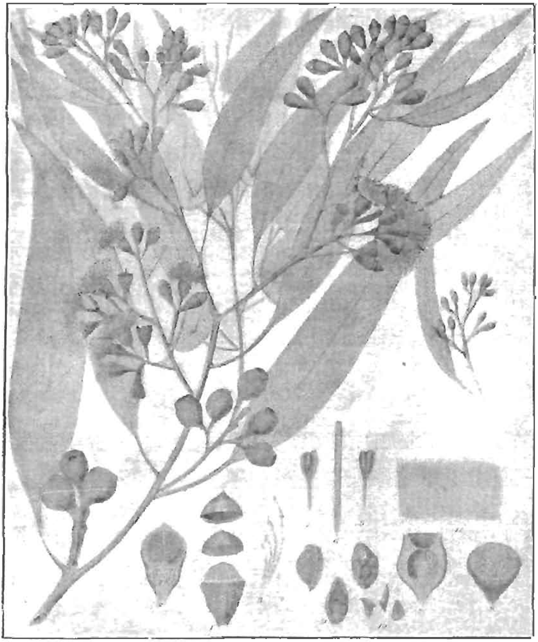


Fig. 44.—The Spotted Gum (*Eucalyptus maculata,* Hooker).

THE SPOTTED GUM (*Eucalyptus maculata,* Hooker).

Fig. 44.

A handsome tree, with a straight stem sometimes of a length of 90 feet up to the branches, and a diameter up to 3 feet. The bark is smooth, somewhat shining, whitish or sometimes reddish-grey, mottled by bluish-white or brown-reddish spots, hence the

vernacular as well as the botanical name. Leaves scattered on slightly angular branchlets, elongated or narrow lance-shaped, often somewhat sickle-shaped, seldom more oval, of equal green on either side, more or less shining, sometimes but slightly so; their lateral veins crowded, spreading and rather prominent, the marginal vein close to the edge of the leaf. Flowers in usually short tufts, two or three together or some solitary, rarely four or more, two umbels occasionally arising from one point appearing like one, with six or seven flowers; the somewhat angular stalklets are shorter than the flower cup, the tube of which is almost half egg-shaped or slightly bell-shaped; the lid of the bud is double, the outer one half-round and pointed, the inner one depressed semiglobular, almost or quite blunt, transparent and shining; fruits globular or oval urn-shaped, with three, rarely two or four, deeply enclosed valves. The fruits vary from $\frac{1}{3}$ to $\frac{2}{3}$ of an inch in length, slightly rough or faintly wrinkled.

The timber is used in shipbuilding, wheelwright work, frame work, and street paving.

(To be continued.)

PURIFYING WATER FOR STOCK.

A simple method for purifying almost any water for drinking without boiling it, has been worked out by Dr. G. G. Naismith, director of the Health Laboratories of Toronto, Canada, and Dr. R. R. Graham, assistant chemist. The process is as follows:—Add a teaspoonful (not heaped up) of chloride of lime, containing about one-third available chlorine to a cupful of water. Dissolve, and add in any convenient receptacle three more cupsfull of water. Stir and allow to stand for a few seconds in order to let the particles settle. This stock solution, if kept in a tightly stoppered bottle, may be used for five days. Add a teaspoonful to 2 gallons of water to be purified; stir thoroughly in order that the weak chlorine solution will come into contact with all the bacteria, and allow to stand for ten minutes. This will effectually destroy all typhoid and colon bacilli, or other dysentery producing bacilli in the water. The water will be without taste or odour, and the trace of free chlorine added rapidly disappears.

Water containing mud in suspension is easily clarified by dropping hot wood ashes into it, or by the application of lime or alum. These two substances make the water hard. Chloride of iron may also be used. It is quite harmless, and a valuable constituent for all animals. Medical men prescribe iron in one of its several forms as a tonic. One pound of chloride of iron (2d. per lb.) will clarify 1,000 to 2,500 gallons of muddy water, and much reduce the bacterial contents.

STATE RESEARCH FARM, WERRIBEE.

Meteorological Observations.

G. S. Gordon, Field Officer, Werribee.

Summary of observations made during 1915, and comparison with previous years:—

RAINFALL.

Average rainfall for forty-two years prior to 1913 .. .. = 20·19 inches
Rainfall during 1913 (505 points in March) .. .. .. = 16·43 „
Rainfall during 1914 (304 points in December) .. .. = 13·24 „
Rainfall during 1915 .. .. = 15·55 „

EVAPORATION.

Evaporation from free water surface, 1913 .. .. .. = 46·438 inches
„ „ „ „ 1914 .. .. .. = 50·548 „
„ „ „ „ 1915 .. .. .. = 51·754 „

BRIGHT SUNLIGHT.

Total bright sunlight during 1914 = 1,906·5 hours = Daily Mean, 5·2 hours.
„ „ „ 1915 = 1,865·9 „ = „ 5·1 „

MEAN AIR TEMPERATURES.

Year.	Dry Bulb.	Wet Bulb.	Maximum.	Minimum.
1914	59·4° F.	55·8° F.	69·6° F.	48·6° F.
1915	57·9° F.	53·8° F.	67·4° F.	47·8° F.

MEAN SOIL TEMPERATURES.

Year.	At 1 Inch.		At 6 Inches.		At 12 Inches.		At 24 Inches.	
	Maximum.	*Minimum.*	*Maximum.*	*Minimum.*	*Maximum.*	*Minimum.*	*Maximum.*	*Minimum.*
1914 ..	70·9° F.	50·6° F.	63·6° F.	52·6° F.	61·0° F.	56·8° F.	60·2° F.	58·6° F.
1915 ..	72·1° F.	50·8° F.	63·2° F.	51·5° F.	60·8° F.	55·5° F.	59·9° F.	57·2° F.

MEAN OF MAXIMUM AND MINIMUM SOIL TEMPERATURES.

Year.	At 1 Inch.	At 6 Inches.	At 12 Inches.	At 24 Inches.
1914	60·7° F.	58·1° F.	58·90° F.	59·4° F.
1915	61·4° F.	57·3° F.	58·1° F.	58·5° F.

SHARE-FARMING RESULTS.

Last year an appeal was made to the farmers of the State to sow as large an area as possible with wheat in anticipation of good prices. The capacity of many wheat-growers to respond, however, was limited in many cases by lack of capital, owing to the failure of the previous harvest through drought. A number of city investors interested themselves in the extension of the wheat area, and expressed a desire to invest money in wheat growing without engaging in the work themselves.

They wanted to get in touch with men who had land but who were without the means to secure extra plant and extra teams to put in additional areas of wheat.

Through the Department of Agriculture a number of such farmers and investors were put in touch with one another, and arrangements made for the investors to finance additional areas sown to wheat. One investor has just forwarded to the Department a summary of the results of his investment, and in expressing his satisfaction at the result intimates that he has concluded arrangements for financing larger areas for the coming year.

The investor referred to financed 204 acres in Borung, and 500 acres in the Mallee on the share system. He paid the farmer a fixed sum for putting in and taking off the crop, supplied two-thirds of the seed and manure, and took two-thirds of the crop. The results were as follows:—

BORUNG.

Outlay—

	£	s.	d.
1. Cash advance to farmer for working 204 acres of land at £1 ..	204	0	0
2. Seed wheat, at 7s. per bushel	50	0	0
3. Two-thirds of 5 tons of superphosphate	15	10	3
4. Sacks	35	15	0
Total cost	305	13	3

Return—

Investor's share of wheat, 2,934 bushels.

MALLEE.

Outlay—

	£	s.	d.
1. Cash advance to farmer for working 500 acres of wheat at 16s.	400	0	0
2. Seed wheat and freight..	74	9	0
3. Manure	25	1	0
4. Bags and freight	44	14	6
5. Cartage, 8 miles	41	2	0
Total cost	585	6	6

Return—

Investor's share of wheat, 3,744 bushels and 52 tons hay.

For a total investment of £890 19s. 9d., therefore, he has received 6,678 bushels of wheat at the railway siding, and 52 tons of hay.

If the value of the hay is placed at 30s. a ton, the total cost of the wheat to the investor would be £813, or 2s. 5¼d. per bushel. His initial advance from the wheat pool, however, amounts to 2s. 6d. per bushel,

consequently whatever dividend the pool distributes will be his profit on the transaction. As the f.o.b. price of wheat is at present 5s. 3½d., he will be substantially rewarded for his enterprise. Assuming the distribution from the pool to be only 1s. 6d. per bushel, the investor will reap a net profit of £500 on an outlay of £890.

Both the farmers and the investor are satisfied with their joint operations. The farmers stated that had it not been for the investor they would not have been able to put in the extra 704 acres of land. They received cash advances of 16s., and £1 per acre, which was their estimated cost of the working of the land, and, in addition, they received for the rent of their land one-third of the crop, amounting in all to 3,339 bushels, less their third share of the cost of seed and manure.

Fresh contracts with these farmers, involving 1,000 acres of new land, have been drawn up for the coming year, and provision is being made for cultivating the land more thoroughly than was possible last season.

The above case is an interesting illustration of the manner in which financiers may assist in increasing the output of foodstuffs with advantage to themselves, the farmers, and the Empire, and the Department will be glad to again act as the intermediary on receipt of communications from those willing to invest.

VERNACULAR NAMES OF VICTORIAN PLANTS.

Continued from page 58, Vol. XIV. (10th January, 1916).

Communicated by Alfred J. Ewart, D.Sc., Ph.D., Chairman, and C. S. Sutton, M.B., Ch.B., Secretary of the Plant Names Committee of the Field Naturalists' Club of Victoria.

Botanical Name.	Popular Name.	Use or Character.
SYMPETALEÆ PERIGYNÆ—*continued.*		
COMPOSITÆ.		
Vernonia—		
cinerea, Lessing ..	Grey Vernonia	
Adenostemma—		
viscosum, R. and G. Forster	Gland Daisy	
Lagenophora—		Of no known economic value.
Billardieri, Cassini ..	Asiatic Bottle-Daisy ..	
Huegelii, Benth. ..	Coarse Bottle-Daisy ..	
Solenogyne—		
Emphysopus, F.v.M. ..	Dwarf Bottle-Daisy ..	
Brachycome—		
diversifolia, Fisch and Mey.	Tall Daisy	Worthy of garden culture.
melanocarpa, Sonder and F.v.M.	Black-fruited Daisy ..	
radicans, Steetz ..	Marsh Daisy	
goniocarpa, Sonder and F.v.M.	Dwarf Daisy	
pachyptera, Turcz ..	Hard-Head Daisy ..	Several species might be improved by selection and cultivation, more especially B. nivalis, B. scapiformis, stricta, and multifida.
scapigera, D.C.	Tufted Daisy	
parvulla, Hook. f. ..	Small Daisy	
graminea, F.v.M. ..	Grass Daisy	
angustifolia, Cunn. ..	Stiff Daisy	
basaltica, F.v.M. ..	Basalt Daisy	
trachycarpa, F.v.M. ..	Rough Daisy	
exilis, Sonder	Slender Daisy	

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	SYMPETALEÆ PERIGYNÆ—*continued.*	
COMPOSITÆ—*continued.*		
Brachycome—continued—		
ptychocarpa, F.v.M. ..	Tiny Daisy	Several species might be improved by selection and cultivation, more especially B. nivalis, B. scapiformis, stricta, and multifida.
debilis, Sonder	Weak Daisy	
decipiens, Hook. f. ..	Field Daisy	
cardiocarpa, F.v.M. ..	Swamp Daisy	
nivalis, F.v.M.	Snow Daisy	
scapiformis, D.C. ..	Coarse Daisy	
stricta, D.C.	Erect Daisy	
ciliaris, Lessing ..	Fringe Daisy	
calocarpa, F.v.M. ..	Desert Daisy	
chrysoglossa, F.v.M. ..	Golden Daisy	
multifida, D.C.	Blue Daisy	
collina, Benth.	Hill Daisy	
Minuria—		
leptophylla, D.C. ..	Silky Minuria	Of no known economic value.
Cunninghamii, Benth. ..	Bush Minuria	
integerrima, Benth. ..	Smooth Minuria ..	
denticulata, Benth. ..	Downy Minuria ..	
suaedifolia, F.v.M. ..	Fleshy Minuria ..	
Calotis—		
cuneifolia, R.Br. ..	Bindi Burr Daisy ..	Of no known economic value.
glandulosa, F.v.M. ..	Glandular Burr Daisy ..	
cymbacantha, F.v.M. ..	*Yellow Burr Daisy* ..	
erinacea, Steetz ..	Prickly Burr Daisy ..	
scabiosifolia, Sonder and F.v.M.	Rough Burr Daisy ..	
scapigera, Hook. ..	Tufted Burr Daisy ..	
anthemoides, F.v.M. ..	You Yang Burr Daisy ..	
lappulacea, Benth ..	Common Burr Daisy ..	
microcephala, Benth. ..	Small-headed Burr Daisy..	
plumulifera, F.v.M. ..	Feathery Burr Daisy ..	
hispidula, F.v.M. ..	Hairy Burr Daisy ..	
Olearia—		
megalophylla, F.v.M. ..	Large-leaved Aster ..	Many are worthy of garden culture, more especially O. myrsinoides, O. argophylla, O. speciosa, O. stellulata, O. dentata, ramulosa, ciliata, pimelioides, megalophylla, pannosa, and rudis. The wood of O. argophylla is used in cabinet work, and its foliage is fragrant.
alpicola, F.v.M. ..	Alpine Aster	
viscosa, Benth.	Viscid Aster	
pannosa, Hook. ..	Velvet Aster	
argophylla, F.v.M. ..	Musk Aster	
myrsinoides, F.v.M. ..	Myrsine Aster	
dentata, Moench ..	Wrinkled Aster	
speciosa, Hutch. ..	Showy Aster	
stellulata, D.C.	Snow-bush Aster ..	
Frostii, F.v.M.	Hoary Aster	
asterotricha, F.v.M. ..	Rough Aster	
tubiflora, Benth. ..	Tube Aster	
axillaris, F.v.M. ..	Coast Aster	
ramulosa, Benth. ..	Twiggy Aster	
floribunda, Benth. ..	Heath Aster	
microphylla, Benth. ..	Small-leaved Aster ..	
lepidophylla, Benth. ..	Club-moss Aster ..	
subspicata, Benth. ..	Spiky Aster	
pimeleoides, Benth. ..	Pimelea Aster	
iodochroa, F.v.M. ..	Violet Aster	
calcarea, F.v.M.. ..	Limestone Aster ..	
magniflora, F.v.M. ..	Large Aster	
Muelleri, Benth. ..	Dusky Aster	
decurrens, Benth. ..	Clammy Aster	
Toppi, Ewart and White ..	Mallee Aster	
glutinosa, Benth., (oraria, F.v.M.)	Sticky Aster	
teretifolia, F.v.M. ..	Desert Aster	
Hookeri, Benth. ..	Rare Aster	
glandulosa, Benth. ..	Swamp Aster	
stricta, Benth.	Erect Aster	
adenophora, F.v.M. ..	Brush Aster	
picridifolia, Benth. ..	*Rasp Aster*	
rudis, F.v.M.	Harsh Aster	
ciliata, F.v.M.	Blue Aster	
Celmisia—		
longifolia, Cass	Silver Celmisia	Worthy of garden culture especially in mountainous districts or in rockeries.

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	SYMPETALEÆ PERIGYNÆ—*continued.*	
COMPOSITÆ—*continued.*		
Cratystylis—		
conocephala, Sp. le Moore	Cone Aster	
Vittadinia—		
australis, A. Rich	New Holland Daisy	
Erigeron—		
pappochromus, Labill.	Violet Fleabane	
minurioides, Benth.	Hill Fleabane	
conyzoides, F.v.M.	Coast Fleabane	
Epaltes—		
Tatei, F.v.M.	Dwarf Epaltes	
Cunninghamii, Benth.	Erect Epaltes	
australis, Lessing	Spreading Epaltes	*Of no known economic value.*
Stuartina—		
Muelleri, Sond.	Spoon Cudweed	
Gnaphalium—		
luteo-album, L.	Jersey Cudweed	
japonicum, Thunb.	Japanese Cudweed	
collinum, Labill.	Creeping Cudweed	
alpigenum, F.v.M.	Mountain Cudweed	
purpureum, L.	Purple Cudweed	
indutum, Hook. f.	Tiny Cudweed	
Traversii, Hook. f.	Stalked Cudweed	
Parantennaria—		
uniceps, Beauv.	Mountain Everlasting	Might be worthy of garden culture in mountainous districts or in rockeries.
Ewartia—		
Catipes, Beauv.	Silver Edelweiss	
nubigena, Beauv.	Brown Edelweiss	
Podotheca—		
angustifolia, Cass	Narrow-leaved Podotheca	
Ixiolaena—		
leptolepis, Benth.	Stalked Ixiolaena	Of no known economic value.
tomentosa, Sond. and F.v.M.	Woolly Ixiolaena	
Podolepis—		
rhytidochlamys, F.v.M.	Wrinkled Podolepis	
longipedata, Cunn.	Long Podolepis	
acuminata, R.Br.	Large Podolepis	Worthy of garden culture more especially *P. acuminata.*
canescens, Cunn.	Grey Podolepis	
rugata, Labill.	Pleated Polodepis	
Lessoni, Benth.	Wiry Podolepis	
Siemssenii, F.v.M.	Slender Podolepis	
Athrixia—		
tenella, Benth.	Wire Wort	
Leptorrhynchus—		
squamatus, Lessing	Scaly Buttons	
panaetioides, Benth.	Woolly Buttons	
tenuifolius, F.v.M.	Slender Buttons	Of no known economic value
ambiguus, Benth.	Doubtful Buttons	
pulchellus, F.v.M.	*Beauty Buttons*	
elongatus, D.C.	Lanky Buttons	
Waitzia, Sonder.	Immortelle Buttons	
linearis, Less.	Shiny Buttons	
Waitzia—		
acuminata, Steetz.	*Immortelle*	Worthy of garden cultivation.
Helipterum—		
anthemoides, D.C.	Camomile Sunray	
polygalifolium, D.C.	Milkwort Sunray	
floribundum, D.C.	Profuse Sunray	
incanum, D.C.	Hoary Sunray	
Cotula, D.C.	Mayweed Sunray	
Jesseni, F.v.M.	Orange Sunray	
hyalospermum, F.v.M.	Golden Sunray	
strictum, Benth.	Erect Sunray	All are more or less worthy of garden culture especially H. floribundum, H. Cotula and H. moschatum.
corymbiflorum, Schlech.	White Sunray	
microglossum, Maiden and Betche	Silver Sunray	
pygmaeum, Benth.	Pygmy Sunray	
moschatum, Benth.	Musk Sunray	
laeve, Benth.	Smooth Sunray	
exiguum, F.v.M.	Tiny Sunray	
dimorpholepis, Benth.	Common Sunray	

Vernacular Names of Victorian Plants—*continued.*

Sympetaleæ Perigynæ—*continued.*

Botanical Name.	Popular Name.	Use or Character.
Compositæ—*continued.*		
Helichrysum—		
Baxteri, Cunn.	White Everlasting	
rutidolepis, D.C.	Pale Everlasting	
scorpioides, Labill.	Curling Everlasting	
Tepperi, F.v.M.	Delicate Everlasting	
obtusifolium, Sond. and F.v.M.	Blunt Everlasting	
dealbatum, Labill.	Silver Everlasting	
bracteatum, Willd.	Golden Everlasting	
elatum, Cunn.	Tall Everlasting	All are more or less worthy of garden culture, and many should find permanent places in our gardens, especially H. Baxteri, H. bracteatum, H. Blandowskianum, H. rosmarinifoluim. H. obcordatum, H. elatum, and H. Stirlingii.
adenophorum, F.v.M.	Slender Everlasting	
leucopsidium, D.C.	Satin Everlasting	
Blandowskianum, Steetz	Woolly Everlasting	
apiculatum, D.C.	Pointed Everlasting	
semipapposum, D.C.	Downy Everlasting	
diotophyllum, F.v.M.	Heath Everlasting	
adnatum, Benth.	Rough Everlasting	
cinereum, F.v.M.	Coast Everlasting	
rosmarinifolium, Less.	Rosemary Everlasting	
ferrugineum, Lessing	Shrubby Everlasting	
Stirlingi, F.v M.	Mountain Everlasting	
obcordatum, F.v.M.	Grey Everlasting	
Backhousii, F.v.M.	Riceflower Everlasting	
cuneifolium, F.v.M.	Wedge Everlasting	
baccharoides, F.v.M.	Alpine Everlasting	
Cassinia—		
longifolia, R.Br.	Shining Cotton-wood	Might be improved by garden culture.
aculeata, R.Br.	Common Cotton-wood	Of no known economic value.
quinquefaria, R.Br.	Slender Cotton-Wood	
arcuata, R.Br.	Drooping Cotton-Wood or Chinese Scrub	Proclaimed under the Thistle Act for the Shires of Maldon and Waranga.
spectabilis, R.Br	Showy Cotton-Wood	Worthy of cultivation as an ornamental plant.
Humea—		
*elegans, Smith	Plumed Humea	A biennial plant worthy of garden culture
ozothamnoides, F.v.M.	Cottony Humea	Of no known economic value.
squamata, F.v.M.	Scaly Humea	
Rutidosis—		
leiolepis, F.v.M.	Rock Wrinklewort	
leptorrhynchoides, F.v.M.	Button Wrinklewort	Of no known economic value.
helichrysoides, D.C.	Grey Wrinklewort	
Pumilo, Benth.	Small Wrinklewort	
Ammobium—		
alatum, R.Br.	Winged Sand Daisy	Well worthy of garden culture.
Ixodia—		
achilleoides, R.Br.	Ixodia	
Millotia—		
tenuifolia, Cass.	Soft Millotia	
Toxanthus—		
perpusillus, Turcz.	Tiny Bowflower	
Muelleri, Benth.	Large Bowflower	
Quinetia—		
Urvillei, Cass.	Quinetia	
Myriocephalus—		
rhizocephalus, Benth.	Dwarf Thick-Heads	
Stuartii, Benth.	Tall Thick Heads	
Angianthus—		
tomentosus, Wendl.	Hairy Cupflower	Of no known economic value.
brachypappus, F.v.M.	Spreading Cupflower	
tenellus, Benth.	Slender Cupflower	
pusillus, Benth.	Dwarf Cupflower	
Preissianus, Benth.	Flat Cupflower	
strictus, Benth.	Stiff Cupflower	
Gnephosis—		
Baracchiana, Ewart and White	Dwarf Gnephosis	
skirrophora, Benth.	Woolly *Gnephosis*	
Eriochlamys—		
Behrii, Sond. and F.v.M.	Woolly Mantle	

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
SYMPETALEÆ PERIGYNÆ—*continued.*		
COMPOSITÆ—*continued.*		
Calocephalus—		
Drummondi, Benth.	Dwarf Beauty Heads	Considered to be injurious to stock, but this is usually merely due to a mechanical action on the bowels. The fluff from the flowers occasionally causes inflammation of the lungs in stock.
Brownii, F.v.M.	Coast Beauty Heads	
Sonderi, F.v.M.	Pale Beauty Heads	
lacteus, Lessing	Milky Beauty Heads	
citreus, Lessing	Lemon Beauty Heads	
Gnaphalodes—		
uliginosum, A. Gray	Flannel Cudweed	No known economic value.
Craspedia—		
Richea, Cassini	Big Billybuttons	Might be worthy of garden culture.
pleiocephala, F.v.M.	Small Billybuttons	
chrysantha, Benth.	Golden Billybuttons	
globosa, Benth.	Tall Billybuttons	
Chthonocephalus—		
pseudevax, Steetz.	Ground Heads	No known economic value.
Siegesbeckia—		
orientalis, L.	Indian Weed	A troublesome weed in arable land.
Eclipta—		
platyglossa, F.v.M.	Yellow Twin Heads	Of no known economic value.
Bidens—		
tripartita, L.	Trifid Bur-Marigold	
Glossogyne—		
tenuifolia, Cass.	Earwig Marigold	
Cotula—		
filifolia, Thunb.	Slender Cotula	
coronopifolia, L.	Swamp Cotula	
australis, Hook. f.	Common Cotula	
alpina, Hook. f.	Alpine Cotula	
reptans, Benth.	Creeping Cotula	
filicula, Hook. f.	Mountain Cotula	
integrifolia, Hook. f.	Thread Cotula	
Centipeda—		
orbicularis, Loureiro	Spreading Sneezeweed	Considered to be injurious to stock, but the injury is of a mechanical nature, the plants having no true poisonous properties.
Cunninghami, F.v.M.	Erect Sneezeweed	
thespidioides, F.v.M.	Desert Sneezewood	
Abrotanella—		
nivigena, F.v.M.	Munyang Snow-Wort	Of no known economic value.
Elachanthus—		
pusillus, F.v.M.	Elacanth	
Isoetopsis—		
graminifolia, Turcz.	Grass Cushion	
Senecio—		
Gregorii, F.v.M.	Fleshy Senecio	All are more or less worthy of cultivation, especially O. magnificus, O. vagus, O. odoratus, and O. pectinatus.
platylepis, D.C.	Toothed Snecio	
pectinatus, D.C.	Alpine Senecio	
spathulatus, A. Richard	Spoon Senecio	
magnificus, F.v.M.	Showy Senecio	
lautus, Soland.	Variable Senecio	
vagus, F.v.M.	Saw Senecio	
velleyoides, Cunn.	Forest Senecio	
australis, Willd.	Fire-Weed Senecio	
Behrianus, Sond. & F.v.M.	Stiff Senecio	
brachyglossus, F.v.M.	Slender Senecio	
Georgianus, D.C.	Grey Senecio	
odoratus, Hornemann	Scented Senecio	
Cunninghamii, D.C.	Branching Senecio	
Bedfordia—		
salicina, D.C.	Blanket Wood	Timber is useful for cabinet work (up to 18 inches in diameter). This plant yields a white flock from the under part of the leaves. Paper could be made from it, but as a source of paper material on a commercial scale, it would be insignificant.

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
SYMPETALEÆ PERIGYNÆ—*continued.*		
COMPOSITÆ—*continued.*		
Erechtites—		
prenanthoides, D.C. ..	Toothed Fire-Weed ..	All are troublesome weeds.
arguta, D.C.	Rough Fire-Weed ..	
mixta, D.C.	Fluffy Fire-Weed ..	
quadridentata, D.C. ..	Cotton Fire-Weed ..	Proclaimed under the Thistle Act for the whole State.
hispidula, D.C.	Stiff Fire-Weed ..	A troublesome weed.
Cymbonotus—		
Lawsonianus, Gaudich ..	Cymbonotus	Has a slight pasture value.
Centaurea—		
australis, Benth. and Hook. f.	Austral Cornflower ..	Might be worthy of garden cultivation.
Microseris—		
Forsteri, Hook. f. ..	Murrnong Yam	The tubers are sweet and milky; were largely used as food by the aborigines.
CAMPANULACEÆ.		
Lobelia—		
gibbosa, Labill. ..	Tall Lobelia	Worthy of garden culture. Flowers of a rich ultramarine blue.
rhombifolia, De Vriese ..	Longstalked Lobelia ..	These belong to the sub-order Lobeliaceae, all species of which contain a sharp, burning, or sometimes narcotic latex. When eaten in quantity, the plants are apt to cause internal inflammation, or ultimately death. This applies more particularly to *Lobelia pratioides*, *Pratia erecta*, and Isotoma fluviatilis; but Isotoma axillaris is worthy of garden culture for rockeries, &c.
anceps, L.	Angled Lobelia ..	
purpurascens, R.Br. ..	Purple Lobelia	
pratioides, Benth. ..	Poison Lobelia	
Pratia—		
gelida, Benth.	Snow Pratia	
platycalyx, Benth. ..	Fleshy Pratia	
erecta, Gaud.	Poison Pratia	
puberula, Benth. ..	Alpine Pratia	
pedunculata, Benth. ..	Slender Pratia	
Isotoma—		
axillaris, Lindl. ..	Rock Isotoma	
fluviatilis, F.v.M. ..	*Swamp Isotoma* ..	
Wahlenbergia—		
gracilis, A.DC.	Austral Bluebell ..	Might be improved by garden cultivation.
STYLIDIACEÆ.		
Stylidium—		
graminifolium, Swartz ..	Grass Trigger Plant ..	Might be improved by garden culture.
soboliferum, F.v.M. ..	*Bristly Trigger Plant* ..	Of no known economic value.
calcaratum, R.Br. ..	Spurred Trigger Plant ..	
perpusillum, Hook. f. ..	Slender Trigger Plant ..	
despectum, R.Br. ..	Small Trigger Plant ..	
Levenhookia—		
dubia, Sonder	Hairy Stylewort ..	
Sonderi, F.v.M. ..	Slender Stylewort ..	
BRUNONIACEÆ.		
Brunonia—		
australis, Smith ..	Blue Pincushion ..	Well worthy of garden culture.
GOODENIACEÆ.		
Dampiera—		
Brownii, F.v.M. ..	Mountain Dampiera ..	Worthy of garden culture. D. rosmarinifolia, and D. stricta are particularly recommended.
lanceolata, Cunn. ..	Grooved Dampiera ..	
marifolia, Benth. ..	Velvet Dampiera ..	
rosmarinifolia, Schlech. ..	Rosemary Dampiera ..	
stricta, R.Br.	Blue Dampiera	
Scaevola—		
spinescens, R.Br. ..	Prickly Fanflower ..	*Of no known economic value.*
hispida, Cav.	Hairy Fanflower ..	
apterantha, F.v.M. ..	Winged Fanflower ..	
Hookeri, F.v.M.	Creeping Fanflower ..	
suaveolens, R.Br. ..	Scented Fanflower ..	A hardy evergreen trailer, worthy of garden culture.

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	SYMPETALEÆ PERIGYNÆ—*continued.*	
GOODENIACEÆ—*continued.*		
Scaevola—continued.		
crassifolia, Labill. ..	Coast Fanflower ..	Of no known economic value.
aemula, R.Br. ..	Fairy Fanflower ..	Worthy of garden culture.
microcarpa, Cav. ..	Small-fruited Fanflower ..	Of no known economic value.
Selliera—		
radicans, Cav. ..	Swampweed ..	Of no known economic value.
Goodenia—		
stelligera, R.Br. ..	Spiked Goodenia ..	All more or less worthy of garden cultivation, especially G. hederacea, Macmillani, and G. amplexans. Several have a slight pasture value.
ovata, Smith ..	Hop Goodenia ..	
varia, R.Br. ..	Sticky Goodenia ..	
amplexans, F.v.M. ..	Clasping Goodenia ..	
barbata, R.Br. ..	Twiggy Goodenia ..	
geniculata, R.Br. ..	Bent Goodenia ..	
hederacea, Smith .	Ivy Goodenia ..	
Macmillani, F.v.M. ..	Purple Goodenia ..	
cycloptera, R. Br. ..	*Hairy Goodenia* ..	
elongata, Labill. ..	Lanky Goodenia ..	
pinnatifida, Schlech. ..	Cut-leaved Goodenia ..	
pusilliflora, F.v.M. .	Small-flowered Goodenia	
heteromera, F.v.M. .	Spreading Goodenia ..	
glauca, F.v.M. ..	Pale Goodenia ..	
humilis, R.Br. ..	Tiny Goodenia ..	
paniculata, Smith ..	Panicled Goodenia ..	
gracilis, R.Br. ..	Slender Goodenia ..	
Velleia—		
connata, F.v.M. ..	Erect Velleia ..	Worthy of garden cultivation.
montana, Hook. f. ..	Mountain Velleia ..	
paradoxa, R.Br. ..	Spur Velleia ..	

(To be continued.)

WHEN renting a farm, trust to no verbal lease. Let it be in writing, signed, and sealed. Its stipulations then become commands, and can be enforced. Let it be signed in duplicate so that each party may have an original.

Insert such covenants as to repairs, manner of use, and in restraint of waste, as the circumstances call for, as to particular stipulations. examine leases drawn by those who have had long experience in renting farms, and adopt such as meet your case.

There should be covenants against assigning and under-letting.

If the tenant is of doubtful responsibility, make the rent payable in instalments. A covenant that the crops remain the lessor's till the lessee's contracts with him are fulfilled, is valid against the lessee's creditors. In the ordinary case of renting farms on shares, the Courts will treat the crops as the joint property of landlord and tenant, and thus protect the former's rights.

Above all, be careful in selecting your tenant. There is more in the man than there is in the bond.—Harris and Meyers, *Food for Plants*, 1905.

DRIED YEAST AS FOOD FOR STOCK.

The outstanding feature of yeast, regarded from the food standpoint, is its high content of albuminoids, which commonly constitute about 55 per cent. of the dry matter.

Fresh yeast and pressed yeast have been used to some extent in feeding cattle and pigs with apparently quite satisfactory results; but, as in these forms the yeast deteriorates rapidly, its use for feeding purposes is restricted to the neighbourhood of breweries.

With the construction of more efficient drying apparatus, it has now become possible to place on the market a dried yeast which is free from the foregoing objection, while retaining the nutrient matters of the yeast in a highly digestible form.

To the author's knowledge there are at present four or five yeast-drying plants at work in England, with an annual output of some 2,000 to 3,000 tons.

The product has so far been mainly exported from Germany, where dried yeast has grown in favour so rapidly that the demand is said to have exceeded the supply.

Dried yeast is of a powdery to flaky consistency, varying in colour from light to medium brown. It has an agreeable odour, and its flavour would not be amiss but for a bitterness, arising presumably from top residues. This bitterness, according to experience at Manor Farm, Garforth, which is the experimental farm of the University of Leeds and the Yorkshire Council of Agricultural Education, renders it distasteful to cows, but not to pigs and calves.

Percentage composition varies, but the following may be regarded as an average value:—

Moisture	4.3	per cent
Nitrogen	7.76	per cent. (equal to 48.5 per cent. albuminoids).
Oil	.50	per cent.
Crude Fibre ...	.50	per cent.
Ash	10.70	per cent.
Nitrogen-free Extract	35.50	per cent.

A summary of the results of the experiments at Garforth states dried yeast to be a safe food for cows, pigs, and calves. It proved good food for pigs, but owing to the cows' aversion to the bitter flavour, it is not strongly recommended as a cow fodder. It proved a safe food for calves, but no evidence was obtained as to its merits in comparison with other foodstuffs commonly used in calf-rearing.

In the case of pigs, comparative trials with rations consisting mainly of "sharps" (pollard) showed that the substitution of one-quarter to one-third of the latter by an equal weight of dried yeast gave markedly better results, and in spite of the higher cost of the yeast, the margin of profit on the feeding was undoubtedly increased.

—C. CROWTHER, in the *Journal of the Board of Agriculture*, 1915.

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commenced 15th April, 1915; concluding 14th April, 1916.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.1.16	Totals. 15.1.16 to 14.2.16	Totals. Ten months.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
38	White Leghorns ..	G. McDonnell	1,278	149	1,427	1
34	" ..	H. McKenzie and Son ..	1,253	152	1,405	2
42	" ..	W. M. Bayles	1,234	142	1,376	3
2	" ..	E. A. Lawson	1,253	115	1,368	4
19	" ..	L. G. Broadbent ..	1,214	136	1,350	5
8	" ..	C. J. Jackson	1,206	123	1,329	6
23	" ..	Fulham Park	1,142	148	1,290	7
59	" ..	W. G. Osburne	1,141	144	1,285	8
7	" ..	Marville Poultry Farm ..	1,171	112	1,283	9
5	" ..	J. J. West	1,171	111	1,282	10
30	" ..	A. E. Silbereisen ..	1,146	132	1,278	11
28	" ..	R. Lethbridge	1,129	141	1,270	12
3	" ..	J. H. Gill	1,127	130	1,257	13
54	" ..	W. H. Clingin	1,112	142	1,254	14
21	" ..	E. B. Harris	1,156	96	1,252	15
16	" ..	N. Burston	1,107	137	1,244	16
9	" ..	J. Schwabb	1,125	106	1,231	17
39	" ..	W. M. Sewell	1,101	125	1,226	18
11	" ..	J. B. Brigden	1,103	116	1,219	19
6	" ..	F. Doldissen	1,104	112	1,216	20
60	" ..	John Hood	1,098	117	1,215	21
18	" ..	D. Adams	1,096	116	1,212	22
44	" ..	Mrs. F. M. Oliver ..	1,095	107	1,202	23
27	" ..	J. A. Stahl	1,054	145	1,199	24
26	" ..	A. Mowatt	1,084	113	1,197	25
58	" ..	Thirkell and Smith ..	1,051	144	1,195	26
4	" (5 birds)	R. Hay	1,091	103	1,194	27
20	" ..	R. W. Pope	1,062	125	1,187	} 28
10	" (5 birds)	A. E. Tattleby	1,082	105	1,187	}
13	" ..	T. Hustler	1,081	105	1,186	30
32	" ..	F. Hodges	1,058	125	1,183	31
1	" ..	Mrs. H. Stevenson ..	1,084	98	1,182	32
43	" ..	H. I. Merrick	1,048	127	1,175	33
49	" (5 birds)	Bennett and Chapman ..	1,054	114	1,168	34
24	" ..	Lysbeth Poultry Farm ..	1,062	104	1,166	35
15	..	H. N. H. Mirams ..	1,036	126	1,162	36
22	" ..	S. Buscomb	1,019	139	1,158	37
33	" (5 birds)	A. W. Hall	1,034	107	1,141	38
36	" ..	Weldon Poultry Yards ..	1,006	123	1,129	39
53	" (5 birds)	W. G. Swift	1,063	60	1,123	40
25	" (5 birds)	Giddy and Son	1,036	81	1,117	} 41
55	" ..	W. N. O'Mullane ..	1,004	113	1,117	}
60	" ..	H. C. Brock	1,011	102	1,113	43
48	" ..	C. J. Beatty	1,005	104	1,109	44
41	" ..	J. A. Donaldson ..	989	113	1,102	45
47	" ..	J. C. Armstrong ..	1,008	85	1,093	46
12	" ..	G. Heyman	975	114	1,089	47
46	" ..	R. Berry	960	120	1,080	48
40	" ..	C. C. Dunn	941	123	1,064	49
62	" ..	A. A. Sandland	938	114	1,052	50
37	" ..	A. Ross	908	120	1,028	51
45	" ..	South Yan Yean Poultry Farm	940	77	1,017	52
57	" ..	B. Mitchell	912	92	1,004	53
14	" ..	W. Flood	881	115	996	54
31	" ..	L. McLean	844	118	962	55
56	" (5 birds)	C. Hurst	798	105	903	56
		Total	59,681	6,568	66,249	

Fifth Victorian Egg-laying Competition, 1915–16—*continued.*

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.1.16	Totals. 15.1.16 to 14.2.16	Totals. Ten months.	Position in Competition.
		LIGHT BREEDS.				
		Dry Mash.				
80	White Leghorns ..	W. H. Robbins	1,290	128	1,418	1
68	,, ..	H. McKenzie and Son ..	1,215	152	1,367	2
79	,, ..	Lysbeth Poultry Farm ..	1,116	134	1,250	3
76	,, ..	A. A. Sandland	1,100	143	1,243	4
63	,, ..	A. H. Padman	1,108	126	1,234	5
62	,, ..	Benwerren Egg Farm ..	1,086	132	1,218	6
60	,, ..	E. MacBrown	1,096	107	1,203	7
67	,, ..	C. C. Dunn	1,047	128	1,175	8
66	,, ..	E. A. Lawson	1,055	119	1,174	9
65	,, ..	Thirkell and Smith ..	1,039	131	1,170	10
71	,, ..	Moritz Bros.	1,034	126	1,160	11
61	,, ..	Mrs. H. Stevenson ..	1,027	129	1,156	12
72	,, ..	Mrs. E. Zimmerman ..	1,039	116	1,155	13
78	,, ..	H. Hanbury	1,035	78	1,113	14
64	,, (2 birds)	W. M. Bayles	1,060	44	1,104	15
73	,, ..	C. L. Lindrea	904	153	1,057	16
77	,, ..	South Yan Yean Poultry Farm	914	128	1,042	17
74	,, ..	J. H. Gill	800	93	893	18
75	,, (5 birds)	Fulham Park	781	87	868	19
		Total	19,746	2,254	22,000	
		HEAVY BREEDS.				
		Wet Mash.				
86	Black Orpingtons ..	C. E. Graham	1,196	106	1,302	1
97	,, ..	Marville Poultry Farm ..	1,149	104	1,253	2
89	Rhode Island Reds	E. W. Hippe	1,077	115	1,192	3
85	Black Orpingtons ..	H. H. Pump	1,069	112	1,181	4
92	,, ..	J. Ogden	1,065	115	1,180	5
81	,, ..	Mrs. T. W. Pearce ..	1,060	117	1,177	6
100	,, (5 birds)	J. H. Wright	1,062	82	1,144	7
93	,, ..	L. W. Parker	1,041	90	1,131	8
88	,, ..	J. McAllan	1,010	97	1,107	9
91	,, ..	A. Greenhalgh	998	86	1,084	10
84	,, ..	Cowan Bros.	958	113	1,071	11
99	,, ..	L. McLean	973	90	1,063	12
87	,, ..	W. C. Spencer	947	96	1,043	13
90	,, (5 birds)	Oaklands Poultry Farm ..	963	75	1,038	14
98	Faverolles ..	E. Courtenay	906	117	1,023	15
95	Silver Wyandottes ..	W. H. Forsyth	867	75	942	16
94	Black Orpingtons (5 birds)	D. Fisher	863	63	926	17
83	Black Orpingtons ..	G. Mayberry	807	101	908	18
82	White Wyandottes	J. B. Brigden	635	67	702	19
96	White Orpingtons ..	Stranks Bros.	602	31	633	20
		Total	19,248	1,852	21,100	

Monthly Report.

Weather conditions were very changeable this month. Dry, hot winds were followed by much rain, and one or two cold snaps were against egg production. A number of birds are moulting, and, again, there are a lot of broodies. The egg output continues to be very satisfactory. Whilst the health generally is good, there are a few cases of ovarian trouble; these may be expected occasionally amongst exceptionally heavy layers. Temperature, lowest, 52 F.; highest, 108 F. Rainfall, 366 points.

Department of Agriculture,
Melbourne, Victoria.

A. Hart,
Chief Poultry Expert.

ORCHARD AND GARDEN NOTES.

Ed. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

GREEN MANURES.

If a cover crop of leguminous plants is required for green manuring a start at planting may now be made. This can only be done when all the fruit has been gathered from the trees. An early crop is a distinct advantage. The cover crop should make a good growth before the winter sets in, as the plants make very little headway in the cold weather, and they require to be ploughed in as soon as the ground is dry enough in early spring. It will thus be seen that it is necessary to get a good autumn growth, as dense as possible, and one which will well cover the surface before winter.

CULTIVATION.

Should the weather become hot and dry it will be very necessary to give the land surface a good stirring, so as to conserve water supplies. Where fruit crops have been gathered a start may be made late in the month with the autumn ploughing; whatever ploughing is done should be left as rough as possible.

PESTS.

No codlin moth-affected or diseased fruit of any kind should be left on the ground after the crop has been gathered. These should all be destroyed by boiling.

All rust-affected foliage and fruit of plum and peach trees, as well as all other stone fruits that have been attacked by this and other fungus diseases, such as shot-hole, &c., should be burned if possible. This will minimize the possibility of future attacks.

The Vegetable Garden.

Autumn weeds must be kept out of the kitchen garden. These rapidly grow, and remain as robbers right through until the spring time.

The section should be well dug over for planting winter crops. Before digging a light sprinkling of bonedust and a good top dressing of stable manure should be spread on the surface. These may then be dug in, as they provide humus for the soil. Large plots should be avoided in winter; where such occur a path should be run down the centre. This will provide more efficient drainage. The beds, too, may be more raised than in the summer time.

Early onions may be planted out in the beds, and, if not already done, onion seed should be planted at once.

All classes of seedlings may be planted out, and seeds of lettuce, early peas, beet, carrots, radish, cabbage, cauliflower, and swede turnip may be sown.

Asparagus beds should be cleaned up and cut down as soon as the berries begin to colour. Celery rows should be kept earthed up; rhubarb beds should be given a dressing of manure to encourage the coming winter crop, and new rhubarb plantations may now be established.

The Flower Garden.

All classes of spring-flowering bulbs may now be planted. In bulb planting the bulbs should not come in contact with any manure. The manure should, some time previously, have been dug well in, and mixed with the soil, and all heat should have disappeared. If manure is required it should be placed below the bulb, so that the roots may ultimately penetrate to it. Bulbs thrive in sandy soils, and where the soil is heavy a little sand may be added to advantage. Bulbs should not be planted too deeply; the depth to plant is generally regulated by the size of the bulb. Such bulbs as freesias may be covered with only an inch of soil, while larger bulbs may be somewhat deeper.

Dahlias and chrysanthemums may be fed with liquid manure, or mulched with stable or poultry manure. In any case the feeding should not be too strong nor too frequent, and it should always be withheld before the flowers come.

All hardy annual, biennial, and perennial seeds may now be planted. Among these are dianthus, candytuft, sweet peas, Iceland poppies, anemone, ranunculus, stock, wallflower, columbine, foxglove, phlox, penstemon, pansy, gaillardia, &c.

Wherever aphis and red spider occur the plants should be sprayed with benzole emulsion, nicotine, pestend, or soaperine, or some other preventive in order to protect the coming flowers. Mildew attacks on the rose should be warded off by the use of sulphur. The sulphur may be either dusted on the plant or it may be scattered on the ground around and under the plant.

March is one of the best months for transplanting evergreen plants of all classes, trees, shrubs, and palms. The roots of the transplanted plants should be disturbed as little as possible, while the roots of those transplanted from pots should be well uncoiled and set out before planting.

The soil is now warm, and the roots will quickly take hold and grow. They are thus established for the winter, and will give little or no trouble in the subsequent summer heat and dryness.

REMINDERS FOR APRIL.

Live Stock.

HORSES.—Those stabled should be fed liberally. Food of a more stimulating nature can now be given to get them well over the "changing coat" season. Those doing fast or heavy work should be clipped; if not wholly, then trace high. The legs should not be clipped. Those not rugged on coming into the stable at night sweating freely should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Yearling colts if vigorous and well grown may be castrated. Weaned foals should have a little crushed oats daily, if available. Horses to be turned out during winter should not be clipped. Their mouths and feet should be examined and attended to where necessary.

CATTLE.—As the nights become colder the dairy cows should be rugged. The rugs should be removed in day-time when the shade temperature reaches 60 degrees. If new grass is plentiful, give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows may now be spayed.

PIGS.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain. Castrate young boars as early as possible. Pigs should be highly profitable now, as feed is cheap, and pork very dear.

SHEEP.—Merino and fine cross ewes, if they have been mated early, will lamb from now on. Those in lamb to the larger British breeds of rams will give a certain amount of trouble in lambing, and anticipating the extreme value of meat and wool close attention should be given morning and evening to save every lamb possible, and any ewes that may be cast. If the ewes are well-woolled sorts, they will need crutching for fly, at the same time clear wool from around teats, and away from the eyes also. If the ewes are attentive mothers any lambs that are found dead after these precautions, apart from weather conditions, foxes, &c., are just as well gone. Give purgative drenches at first sight of ewes appearing ill in any way. Give warm salad oil to any lambs that are dull in appearance. Ewes after difficult parturition or retention of after-birth can often be saved by flushing out. Reserve fresh pasture, or better still, sow a mixed green crop to turn ewes into later on, but not while carrying the lambs, this is too often injurious. On fine mornings when attending ewes, if feed is plentiful and ewes strong castrate as many ram lambs as possible, they are easily caught when two or three days old. Place them between the feet on the ground, no holder is necessary. In districts where conditions make second dipping a necessity, see that it is done before the weather becomes too unsettled.

POULTRY.—Do not feed maize this month—soft food aids moult; add a teaspoonful of linseed to each bird's ration once daily. The more exercise the hens get the better they moult. Remove all male birds from pens. Add to drinking water one packet Epsom salts to twenty birds. Keep a sharp look out for chicken pox. Forward pullets should now be in their winter quarters, with plenty of scratching litter, and fed liberally—including ration of animal food. Grit shell and charcoal should always be available.

Cultivation.

FARM.—Dig potatoes as they mature. Cart out and spread stable manure. Finish preparation of land for main cereal crops. Sow Chou Moellier seed in beds for transplanting. Sow the following mixture per acre for green feed during the winter months for the dairy herd:—1½ bushels, Oats; ½ bushel, Cape Barley; ½ bushel, Tick Beans; ½ bushel, Vetches. Sow Giant Drumhead Cabbage for transplanting (1 lb. sufficient for 1 acre, in rows 3 feet apart); provided the soil is in good friable condition, plants from seed sown last month should be planted out. Sow wheat and oats according to locality; also rape for winter feed or green manuring. Prepare clean seed-bed for lucerne; and sow Hunter River, Arabian, or Peruvian seed, free from doddor, in drills 7 inches apart and at the rate of 12-16 lbs. of seed per acre. Sow permanent pastures with grasses and clovers.

ORCHARD.—Prepare land for planting; plough deeply and sub-soil. Plant legumes for green manure. Plant out strawberries. Clean up Codlin Moth from trees as soon as all fruit is gathered.

FLOWER GARDEN.—Plant out evergreen shrubs, trees, and Australian plants, divisions of herbaceous plants, seedlings, layers, and rooted cuttings. Feed chrysanthemums with liquid manure weekly until flowers begin to open. Prepare land for future plantings of roses and shrubs.

VEGETABLE GARDEN.—Plant out seedlings from the seed beds. Dig all vacant spaces roughly. Sow onions for early crop; also peas and broad beans. Clean out asparagus beds wherever the seeds are ripening.

VINEYARD.—Consideration must be given to manuring; early application is strongly urged. Peas, &c., for green manuring should be sown as soon as possible.

Cellars.—Cleanliness is emphatically urged. Carefully remove all fermentable refuse—skins, lees, skimmings, &c. Such odds and ends favour multiplication of Vinegar Flies (*Drosophila funebris*). If present destroy these with formalin or insecticide powders. A little bisulphite or sulphurous acid in washing water is recommended; also free use of lime on floors, &c. See February *Journal*, 1914.

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HAND FEEDING DAIRY COWS.

An Experiment.

By B. A. Barr, Senior Dairy Supervisor.

The system of hand feeding, or supplementing the grass by concentrated foods is regarded by many who have not practised it as unprofitable. Some who do practise the system fail to attain the desired result, due partly to the choice of foods and partly to the amounts given.

It is only on farms favorably situated that it is possible to provide sufficient food to maintain a good herd milking at its full capacity throughout the year; consequently, it is both necessary and profitable to provide such an amount of concentrated food—the farm usually produces an abundance of the bulky food—as bran, oats, pollard, gluten feed, oil cakes, &c., at such times as the scarcity of grass or farm-grown crops demands, and the price of milk or butter-fat warrants, for the reasons given in a previous article, "The Dairy Cow as a Machine."*

The leading rule in the feed-shed should be: Give the best feed to milking cows, and as much as they will profitably consume. The best feed is that which contains the largest amount of nourishment for any given price, and is also the cheapest. In selecting feeds, the available nutriment contained in the article is more important than the price. It is not the number of pounds of feed which is purchased for 1s. which determines the relative cheapness of a feed, but the number of pounds of easily-digestible food substances—as protein, carbohydrates, and fat—which is obtained for 1s. Bran, at £4 10s. per ton, is cheaper than lucerne hay at £2 15s. per ton. Bran, at £4 10s. per ton, is equal in

* *Journal of Agriculture*, Victoria, January, 1916, p. 34.

value to oats at 2s. 1d. per bushel. Gluten meal, or polly meal, at £5 per ton, is equal in value to bran at £4 10s. per ton. The oil cakes, linseed, and cocoanut, cannot be compared satisfactorily with bran, oats, &c., because they differ from them so greatly; but from ½ to 2 lbs. may be added to any ration, according to the season.

A mixed ration gives a better return than one composed of a single food. The spring grass, on which the cows milk so heavily, includes a large number of varieties, and what is deficient in one is provided by another, and the mixture of grasses provides a large amount of palatable and digestible food substances.

If more consideration and common sense were given to the feeding of our dairy cows, the fluctuations of the industry caused by seasonal influences would become less, and a more regular, as well as increased, output would result.

In test, or butter-fat percentage, the milk of the Victorian herds is superior to some, and equal to that produced in any dairying country of the world; but in quantity of milk, they are far behind, such being due to a want of the necessary kind and amount of feed which will enable the cows to produce milk to their full capacity for secretion.

It is a significant fact that, whilst the average yield per cow in Victoria is about 380 gallons, and 160 lbs. fat, during an average season, 227 cows, including heifers, during the past dry year, yielded, in nine months, an average return of 572 gallons, and 292 lbs. fat. This return was taken from fifteen herds, where the milk was weighed daily and tested monthly, and in each case the herds were kept for profit—some supplying cream to butter factories.

One herd of 31 cows averaged 809 gallons of milk, and 383 lbs. fat; another of 64 cows averaged 602 gallons, and 337 lbs. fat; whilst, in one instance, 58 cows averaged 334 gallons, and 144 lbs. fat; and another of 20 cows averaged 479 gallons, and 202 lbs. fat. These returns show the difference between good and bad feeding. In every case where a high return was secured, a small amount of concentrated feed was given, and in the others, where a low return was obtained, the cows depended on grass and hay only.

It has been difficult to obtain locally reliable results of feeding various rations, but the following, obtained by a dairy farmer in the north-east of Victoria, is instructive, and proves that, under suitable conditions, it pays to spend a little extra on the cow's feed. It likewise shows that a greater amount of nutriment for conversion into milk can be secured by a careful selection of feeds; the slightly-increased cost materially increasing the profit.

The weight of milk yielded by each cow was weighed daily, and each ration was fed for thirty days.

The paddock feed was dry, and no green fodder was available, but each cow was receiving daily:—

RATION I.

9 lbs.	chaff, at £3 10s. per ton	3½d.
7 lbs.	crushed oats, at 2s. 8d. per bushel ...	5½d.
16 lbs.		9d.

At the writer's suggestion, the ration was changed to:—

RATION II.

10 lbs. chaff, at £3 10s. per ton ...	...	3¾d.
3½ lbs. crushed oats, at 2s. 8d. per bushel ...		2¾d.
2½ lbs. bran, at £4 10s. per ton ...	...	2d. (for bran and pollard)
1 lb. pollard, at £7 per ton ...	...	
1 lb. linseed oil cake, at £10 per ton	...	1d.
18 lbs.		9½d.

The indications which suggested the change were:—

(1) *Gradual decrease in milk yield of heaviest milkers.*

(2) Loss of condition of cows.

(3) An examination of the feed showed that, after due allowance was made for the grass consumed, it contained less nutriment than the milk, plus that required for the maintenance of the animal; consequently, both the milk yield and condition of the cows was rapidly decreasing.

The milk yield was as follows:—

No. of Cow.	Ration No. I.		Ration No. II.		Increase.		Fat.	Months in Milk.	Age.
	Thirty Days' Milk.	Daily Average.	Thirty Days' Milk.	Daily Average.	Thirty Days' Milk.	Daily Average.			
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		yrs.
1 ..	420	14	465	15½	45	1½	2.29	8	2
2 ..	549	18	644	21½	105	3½	4.99	7	7
3 ..	482	16	555	18½	77	2½	4.08	7	2
4 ..	721	24	826	27½	106	3½	5.83	5	6
5 ..	556	18½	571	19	15	8½	1.02	4	2
6 ..	803	27	914	30½	104	3½	5.5	3	7
7 ..	825	27½	1,016	34	191	6½	8.02	3	5
8 ..	675	22½	750	25	75	2½	3.22	2	2
	5,017	21	5,741	24	90	3	34.95	..	..

The milk yield had been gradually decreasing on ration No. I.; by increasing the feed, not only was this checked, but turned into an increase of 35 lbs. of fat, at 1s. 2d., £2 0s. 10d.; the increased cost of food was 10s.; leaving a net profit of £1 10s.; and, in addition to 70 gallons of skim milk and an extension of the milking season, the loss of condition was arrested.

The increase is greater than the figures indicate, because four of the cows were well advanced in their lactation periods, and heavy in calf.

No. 5 did not pay for the extra food, which was stopped.

The profit depended on two factors:—

(1) The cows were not getting all the food which they could profitably transform into milk, and the addition of any nitrogenous foods was rapidly followed by an increase.

(2) An increase of the protein content of the ration by one-third without materially increasing the cost.

Summed up, the advantages, in this case, of properly feeding the cows are:—

(1) The highest market price for farm-grown hay and oats, without any cost for bags, freight, commission, &c.
(2) An extension of the milking season; if each milking cow in this State *milked for one week longer than at present*, on good feed, an additional return of £100,000 would be received.
(3) An expenditure of 10s. on the most suitable feeds brought in an increased return of £2 0s. 10d.
(4) The loss of condition was checked. Those cows heavy in calf, and completing their milking season, gained in weight: and whilst the amount of butter-fat produced left a profit over the cost of feeding, their improved condition *would render them fit to enter at once into a productive* season on calving. Whereas, if the increased feed had had not been supplied, the loss of condition would have been greater, and, on calving, several weeks would be necessary to build them up: and the food used for this would not be available for milk secretion

Charcoal (powdered) is recommended as an absorber of gases in the milk room. It should be freshly powdered and kept there continually, especially in hot weather, when unwholesome odours are most liable to infect the milk.

Eggs may be preserved by adding to a bulk of one bucket of water, two pints of fresh slacked lime, and one pint of common salt. Mix well. Fill a kerosene tin half full with this emulsion, and then put in your eggs. They will keep for a year.

In summer time the season of ripening moves northward at the rate of about 10 miles a day.

APPLE DRYING.

By J. Farrell, Orchard Supervisor.

Owing to the continually increasing area under orchards, land values, and cost of fruit production in this State, the necessity for making provision for the utilization of surplus and waste fruits, has for some time engaged the attention of the Department of Agriculture, and more particularly the officers of the Orchard Supervision Branch.

As increased production of fruit generally means a corresponding increase in the quantity of surplus and waste fruits; the conversion of the latter into economic use is a phase of fruit-growing which it is desired should receive more attention from the fruit-growers in future.

for in the past but little has been done to turn this class of fruit to profit.

Should fruit production increase at the same ratio for the next ten years as it did during the past decade, it is obvious that, after the war, strenuous efforts must be made to find new export markets, as well as to hold those already exploited; for it is only by the judicious manipulation of our exportable fresh fruits that we can expect to maintain our position as a fruit-growing State. The stimulation of Inter-State and local fruit trade is also desirable, and particularly in the interest of small growers who do not export.

In order to show clearly the number of fruit-growers, area under orchards, and the quantity of fruit produced in Victoria during the years 1906-15, the following table, and note under same, have been taken from the *Victorian Year-Book* 1914-1915:—

Orchards Growing Fruit for Sale, 1905-6 to 1914-15.

Year ended March.	Number of Fruit Growers.	Area under Gardens and Orchards.	Large Fruits Gathered.			
			Apples.	Pears.	Quinces.	Plums.
	Acres.	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
1906 ..	5 163	47,312	578,700	219,864	56,898	130,917
1907 ..	5,363	49,086	1,010,381	303,647	77,277	237,468
1908 ..	5,241	49,212	618,424	182,609	47,871	157,366
1909 ..	5,586	50,675	1,241,825	373,145	99,608	167,012
1910 ..	5,647	51,578	1,121,702	253,195	50,559	232,657
1911 ..	5,780	53,325	1 667,271	640,436	86,355	325,677
1912 ..	5,955	55,769	1,330,961	239,431	54,425	151,936
1913 ..	6,285	59,119	2,036,756	669,898	90,119	260,830
1914 ..	6,498	63,058	1,653,035	476,430	67,799	292,389
1915 ..	6,811	70,392	509,697	401,301	32,949	86,698

Year ended March.	Large Fruits Gathered.						
	Cherries.	Peaches.	Apricots.	Oranges.	Lemons.	Figs.	Others.
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
1906 ..	116,845	132,870	154,791	21,364	63,904	32,467	12,339
1907 ..	120,496	276,077	258,049	23,431	37,662	29,549	16,817
1908 ..	71,798	290,178	239,735	28,620	46,827	20,460	10,753
1909 ..	59,012	282,040	149,262	22,363	38,548	23.687	17,462
1910 ..	100,054	291 766	292,496	34,027	51,130	22,675	10,566
1911 ..	121,756	317.317	160,884	59,723	71,041	31,054	21,200
1912 ..	96,663	260,258	281,460	48,982	65,833	17,891	10,259
1913 ..	152,257	289,731	138,881	44,039	48,170	25,223	19,496
1914 ..	151,262	361,414	308,307	63,542	57,562	23,764	15,639
1915 ..	48,411	277,435	109,301	83,220	66,704	17,362	16,040

The area under orchards growing fruit for sale increased steadily from 5.800 acres in 1872-3 to 10,048 in 1882-3, 31.370 in 1892-3, 44,502 in 1902-3, 59,119 in 1912-13, and 70,392 acres in 1914-15—which is the largest area recorded.

The following table, and note under it, also taken from the *Victorian Year-Book*, shows the quantity of dried fruits produced in this State during the years 1905-6 to 1914-15, and for 1895-6 to 1902-3 respectively:—

DRIED FRUITS, 1905-6 TO 1914-15.

Year ended June.	Apples.	Prunes.	Peaches.	Apricots.	Figs.	Pears.	Total.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1906 ..	19,290	9,207	27,703	252,746	29,227	..	338,173
1907 ..	42,113	64,648	109,958	143,970	37,716	..	398,405
1908 ..	35,544	25,504	87,383	223,091	13,112	8,077	392,711
1909 ..	69,120	56,183	84,514	170,620	26,796	30,322	437,555
1910 ..	46,767	76,015	109,661	539,910	22,160	17,422	811,935
1911 ..	26,391	80,123	84,211	334,111	9,554	31,819	566,200
1912 ..	21,929	72,400	143,112	492,041	31,027	16,502	777,011
1913 ..	48,853	84,053	56,151	61,465	27,274	38,633	316,429
1914 ..	39,899	155,031	118,187	363,356	33,551	7,900	717,52
1915 ..	16,817	28,788	70,807	43 606	31,981	55,581	247,670

The quantity of dried fruit (weight after drying) was for the first time collected in 1895-6, when 179,460 lbs. were returned, and it increased to 636,294 lbs. in 1900-1; after which date the quantity, principally by reason of a reduction in apricots, declined to 306,603 lbs. in 1902-3. In 1909-10, the maximum production—811,935 lbs.—was recorded. In 1914-15, the production was 247,670 lbs., which was the lowest return since 1896-7.

The table below, taken from the *Commonwealth Year-Book*, shows the Commonwealth imports and exports of dried fruits, also net imports over exports for the years 1901-13:—

COMMONWEALTH OVERSEA IMPORTS AND EXPORTS OF DRIED FRUITS, 1901, AND 1909 TO 1913.

Year.	Oversea Imports.		Oversea Exports.		Net Imports.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	lbs.	£	lbs.	£	lbs.	£
1901 ..	14,265,731	179,305	831,996	14,206	13,433,735	165,099
1909 ..	13,242,198	121,059	1,089,730	13,013	12,152,468	108,046
1910 ..	9 885,118	89,076	973,171	14,765	8,911,947	74,311
1911 ..	6,526,498	68,942	1,291,795	23,900	5,234,703	45,042
1912 ..	7,484,432	81,913	2,545,779	48,012	4,938,653	33,901
1913 ..	10,551,877	112,489	2,478,585	32,099	8,073,292	80,340

In 1901, the net value of the Commonwealth imports over exports of dried fruit was £165,099; but it came down to £33,901 in 1912, and went up again to £80,340 in 1913, the last year recorded.

There is no reason why the Commonwealth should not produce almost all the varieties of dried fruits required for home consumption, and also have a substantial surplus for export as well.

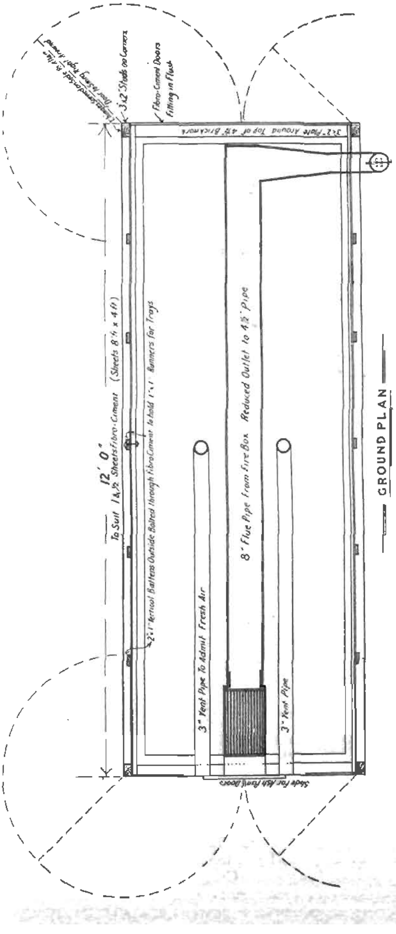
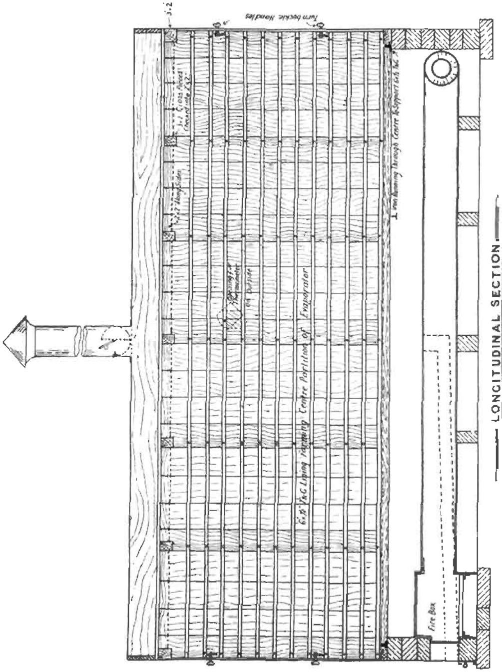

3x2" Studs on Corners
Fibro-Cement Doors Fitting in Flush
3x2" Plate Around Top of 4½" Brickwork
12' 0"
To Suit 1 & 1/2 Sheets Fibro-Cement (Sheets 8' x 4 ft)
2"x1" Vertical Battens Outside Bolted through Fibro Cement to hold 1"x1" Runners for Trays
8" Flue Pipe from Fire Box Reduced Outlet to 4½" Pipe
3" Vent Pipe To Admit Fresh Air
3" Vent Pipe
Slide for Ash Pit Doors
GROUND PLAN

Plate 1.

The increase in fruit production is not confined to Victoria alone, the United States of America, Canada, South Africa, and nearer to home, New Zealand, and the other States of the Commonwealth, are all making preparations to increase their fruit producing capacity.



LONGITUDINAL SECTION

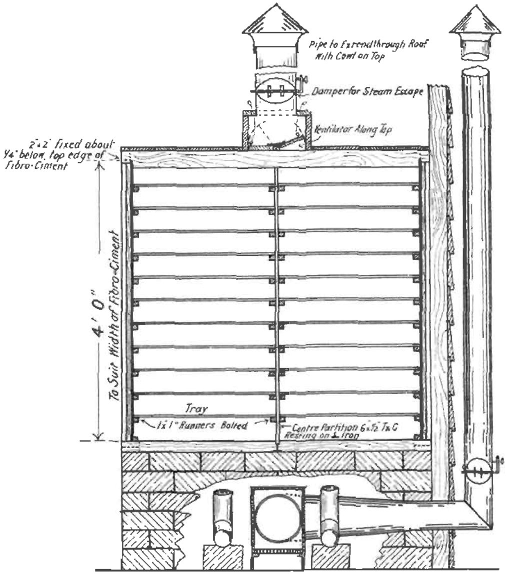
Plate 2.

In view of this state of affairs, students of fruit-growing and fruit distribution realize the necessity for careful management of this industry in order that we may avert the impending chaos.

But it may be stated that, in most countries, up to the present, fresh fruit has been regarded as a luxury, and consequently not consumed in such large quantities as it should have been. Fruit, however, when dried, becomes a staple article of food.

The writer received from the Chief Orchard Supervisor (Mr. Carmody) a letter dated 7th July, 1910, inviting contributions as to the utilization of surplus and waste fruits.

And, later, Mr. Carmody again wrote:—"Victoria is rather backward in literature dealing with fruit culture. I am desirous of you preparing a series of articles dealing with 'Apple Culture' in all its details, with abundant and instructive illustrations, for publication in the *Journal of Agriculture*."



CROSS SECTION

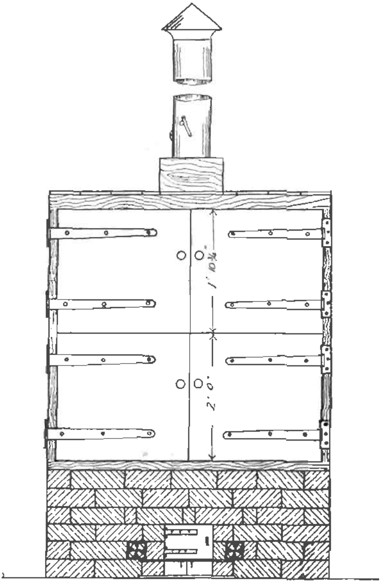
Plate 3.

In consequence of these instructions, a series of articles is being prepared on this subject; but, if published in their proper sequence, this article on fruit-drying would have come last.

Owing, however, to the abnormally heavy crop of apples this year, and the difficulties likely to be met with in marketing same, it has been decided to publish this article first, with a view of pointing out to

the fruit-growers one of the best means of utilizing their unmarketable surplus.

The writer holds that, in order to deal with this phase of fruit-growing properly, it should not be left solely to the management of large drying establishments; but that an evaporator should be regarded as an article of importance in the equipment of every orchard plant, to enable the orchardist and his family to deal with surplus fruit on the spot, and at times suitable to their convenience.



FRONT ELEVATION

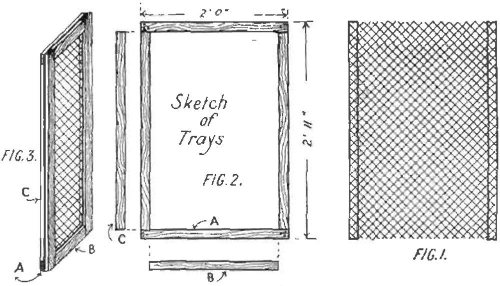
Plate 4.

To meet this requirement, plans—which are original—of an evaporator suitable for this purpose have been drawn, and are figured herewith. *This may be constructed to any scale desired*, and, *taking* the one figured as a standard, and allowing that it has a capacity capable of dealing with the surplus fruit in an orchard of 40 acres, the capacity may be reduced or increased when the building is being constructed for use in smaller or larger orchards respectively.

Plate 1. Ground plan of evaporator, showing fire-box, and 8-in. flue pipe, which heats drying chamber, with a reduced outlet to 4½-in. pipe, with a damper to regulate draught and conserve heat. This method of heating the drying chamber reduces fuel to a minimum, and prevents the products of combustion coming into contact with the drying fruit.

While drying is in progress, it is necessary to provide for the admission of fresh air to the chamber, and at the same time maintain, as far as possible, evenness of temperature. For this purpose, instead of employing the ordinary air vents, two 3-in. galvanized iron pipes, 6 feet long, are employed. They are inserted in the brickwork in close proximity to the fire-box; in consequence of this, they are continually heated, and being slightly elevated at the delivery end, the air enters the chamber in a heated condition; this produces the desired effect.

Plate 2. Longitudinal section, shows one course of bricks on the cross as foundation for 4½-in. brick wall, which supports the woodwork, fire-



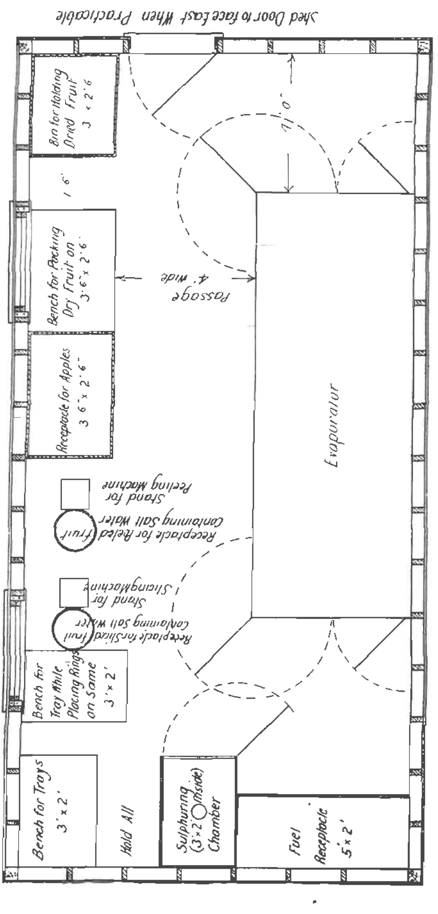
Trays Covered With ½" Galvd Wire Nett.9 24" Wide Lacquered Stretched on broad Oregon Laths

Plate 5.

box, and 8-in. flue from same, with brick supports. The dotted lines represent the 3-in. vent pipe for the admission of fresh air. Centre partition of 6-in. x ½-in. T. and G. lining forming centre portion of the evaporator rests on ⊥ iron, which runs full length of chamber, and is supported by the brickwork at each end. Damper is shown open.

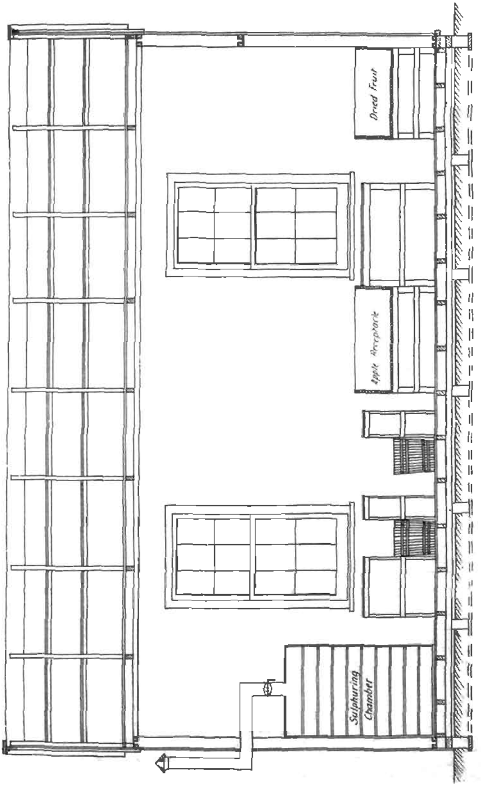
Plate 3. Cross section, shows fire-box, flue pipe, two vent pipes, two chambers for trays, with partition between consisting of ½-in. tongued and grooved wood, resting on I iron, which runs full length of evaporator, and is supported by the brickwork at each end. The weatherboard wall of shed in which evaporator is erected is also shown.

Plate 4. Front elevation. This gives a view of door of fire-box, cast vent faces of 3-in. vent pipes, position of turnbuckle handles on fibro-ciment doors, hinges 18 and 20 inch, the latter so placed on door as to allow same to swing right around so that it may not block up 4-ft. passage, as shown in Plate 1.



Ground Plan Shewing Requisites &c For Drying Plant & Their Arrangement

Plate 6.



Longitudinal Section Shewing Bins, Sulphuring Chamber, &c.

Plate 7.

Plate 5. Sketch of trays. This sketch illustrates method of constructing trays. Take a strip of wire netting ½-in. mesh, 2 ft. 11 in. long, by 2 feet wide, and stretch on oregon laths, like Fig. 1; then put covering laths on, as shown in Fig. 2; then follow lettering in Fig. 2 and Fig. 3, and work can be completed without difficulty.

When apple rings are placed on the trays, and dried in the usual manner, there is a tendency for the fruit acid to cause the wire to

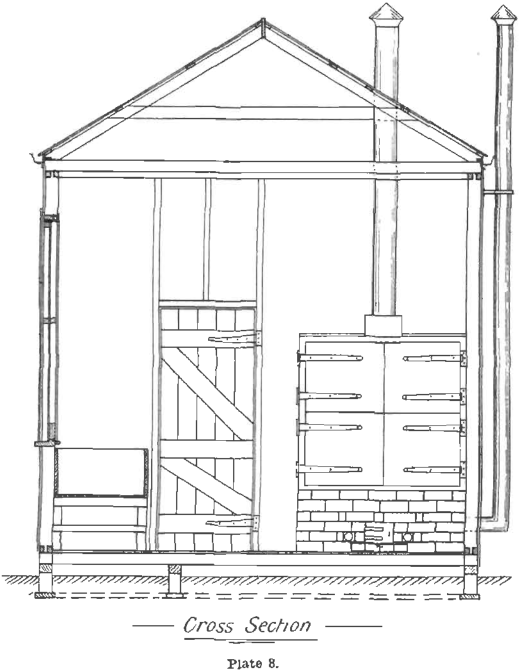


Plate 8.

strip; this has a bad effect on the dried fruit, but it may be prevented by painting the trays, before being used, with lacquer, and then placing them in the evaporator; when dry, they will be ready for use.

Plate 6. Ground plan, showing requisites for drying plant, and their arrangement in the drying shed. There is but little explanation

required in this case, as the plan fully explains itself. However, it may be stated that, when the apples are peeled, sliced, treated with brine, and sulphured, the evaporator is charged with the trays at the fire-box end, and they are drawn, when rings are dry, at the opposite end of the drying chamber. The rings are then put into the dried-fruit bins.

Plate 7. Longitudinal section of drying shed, windows facing "north," showing bins, sulphuring chamber, &c. No further explanation needed.

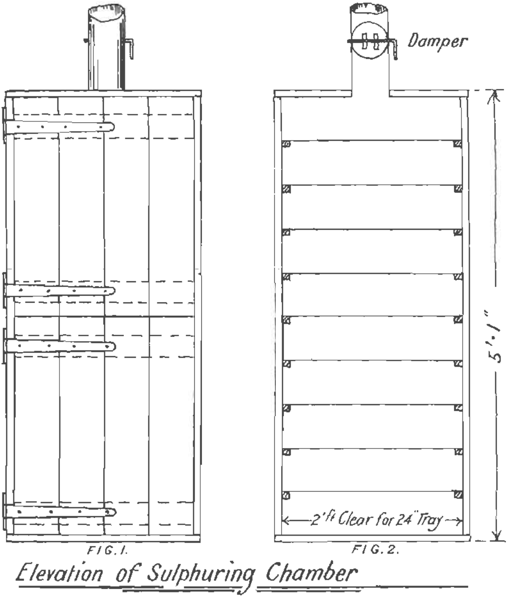


Plate 9.

Plate 8. Cross section of drying shed, showing position of evaporator, and bin for dried fruit.

Plate 9. Elevation of sulphuring chamber.—Fig. 1. This chamber is constructed of wood, with doors closed to show hinges so placed to permit of door swinging right around, for reason previously explained.

Fig. 2. Shows capacity for nine trays, damper open.

CAPACITY OF CHAMBER.

The hot-air capacity of the evaporator above the brickwork is 190 cubic feet, approximately, and, provided the full number of trays (88) are placed in the kiln, and with the fruit in single layer on trays, the surface area of fruit exposed for evaporation, allowing that it dries on both sides, top and bottom, is about 800 square feet; but this area soon becomes reduced as the drying process continues, and the rings become contorted and contracted.

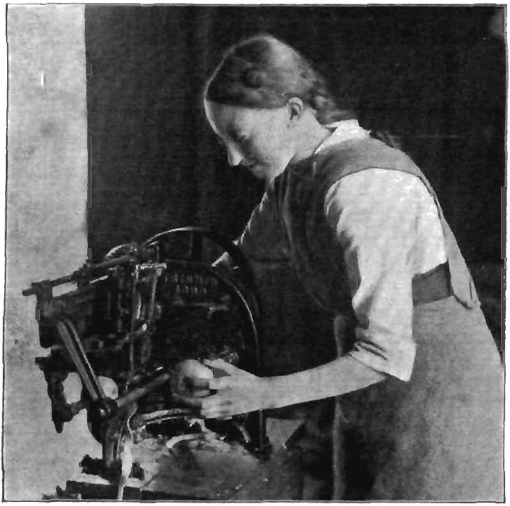


Plate 10.—Peeling machine.

PEELING, CORING, SLICING, AND TRIMMING OF FRUIT.

There are many kinds of peeling and coring machines on the market, but that shown in Plate 10 is one of those most favoured. It is used at Mr. J. Mitchell's drying factory at Wandin, and gives satisfaction. There should be a slot in the machine stand to permit of the skins and cores dropping into a receptacle underneath. The apple, when peeled, drops into the receptacle containing the brine. This machine is so arranged that it can be worked by hand, or power may be applied.

There are three sets of forks, on which the apples are placed, and they revolve at regular intervals, placing the apple in contact with the peeling knife of the machine. There are various slicing machines in

use; the Disc machine is the one generally found in factories. The apple should be sliced into rings of about $\frac{3}{8}$ to $\frac{1}{4}$ inch in thickness.

Prior to slicing, the peeled apples should be taken from the brine receptacle and trimmed, so as to remove any portions of skin missed by the peeling machine, and to pick out any diseased or discoloured parts. Plate 11 shows the make of knife for this work, and method of using same.

BRINING AND SULPHURING.

The object of placing the peeled apple in the brine is to preserve its colour on the outside, and similar treatment after slicing preserves the whole of the exposed surface. The sulphuring of the rings practically

Plate 11.—Trimming apples.

fixes the colour. Plate 12.—Fig. 1. The apple after peeling, and kept for some time in brine. Fig. 2. Ring salted and sulphured. Fig. 3. Dried ring, perfect colour. Fig. 1 and Fig. 2, after being taken from the salt and sulphur respectively, were kept in paper for several days before being photographed. When peeled apples and rings do not receive the salt and sulphur, or other treatment, but are dried in their natural state, the finished product is of a dark-brown colour, lacks attractiveness, and loses points, compared with the well-coloured rings, in commercial value. Plate 13 shows a specimen of this kind.

To make brine for peeled and sliced fruit, salt may be used at the rate of about 2 ozs. to the gallon of water.

When the apple rings are on the trays, and in sulphuring chamber, light about 2 ozs. of sulphur in an earthenware vessel, and place on floor of chamber. Close doors, and allow sulphur fumes to envelope fruit for from five to ten minutes. There are no standards to be observed in these matters.

Drying of Fruit.

Before charging the kiln, it should be brought up to a temperature of about 200 degrees Fahrenheit. As the trays are placed in the evaporator, the temperature rapidly falls to, perhaps, 120 degrees Fahrenheit, according to the surface area of the fruit exposed to the hot air. When in working order, the temperature may be kept at from 120 degrees to 130 degrees Fahrenheit. Again, there is no standard, but the operator will soon learn what is required. Openings are provided for in the walls of the evaporator for the insertion of the thermometer, which should register up to 300 degrees Fahrenheit.

Order of Treating Varieties.

When commencing to dry the season's surplus apples, the orchardist should begin with the kinds not likely to keep well. For instance,

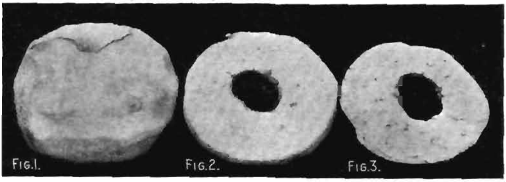


Plate 12.

he would do well by beginning with varieties likely to develop bitter-pit. Then those affected with codlin moth, black spot, &c., might receive attention.

Percentage of Dried Fruit Compared with Fresh.

Apples, when dried, produce as a dried product from 10 to 15 per cent. in weight of the fresh fruit, according to the size and quality of the latter.

Treatment of Cores, Peels, etc.

The cores and skins may be used for making by-products, such as cider and jelly; or they may be dried as a winter food for stock.

Preparing Dried Product for Market.

During the process of peeling, coring, slicing, sulphuring, and drying, a high percentage of the rings become broken into particles.

After being dried, the fruit should be stirred occasionally, and allowed to remain long enough in the bin to attain an evenness of moisture. Then pack for market by selecting whole rings. Pack in rows on flat, in neat, white wood boxes, of 28 lbs. capacity. Smaller

lots may be put up in 1-lb. and 2-lb. attractive cardboard cartons—these may be sold as first quality. The particles may be put up similarly, and sold as "Seconds."

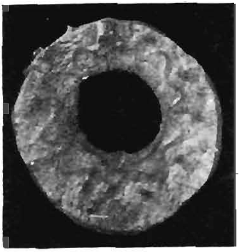


Plate 13.

But the writer is of opinion that, if the "Seconds," while dry and hard, were ground into a meal, say to the consistency of flaked oatmeal, and put up in 1-lb. and 2-lb. cartons, and sold as dried apple "meal," they would then not lose any of their commercial value.

Mr. W. Dabb, orchardist, of Croydon, has built an evaporator on somewhat similar lines to this one; and, while it was in course of construction, Mr. Dabb was in consultation with the writer. A few trial lots have been put through, with satisfactory results.

Although this article deals specially with apple drying, it may be incidentally mentioned that this evaporator is capable of dealing with any of the other fruits dried for commercial use.

Rough Outline of Material Required for Evaporator.

Bricks, 440.
Plates, bottom, 4/12 ft., 4/4 ft. 5 in., 3-in x 2-in., H.W.
Cross pieces to carry top, 5/4 ft. 3¼ in., 3-in. x 2-in. H.W.
Top boarding, 8/12 ft., 6-in. x ¾-in., T. & G.
Vent on top, 1/12 ft., 12-in. x 1-in., shelving.
Vent on sides, 2/12 ft., 6-in. x ⅞-in., T. & G.
Battens at side, 10/4 ft., 2-in. x 1-in., H.W.
Slides for trays, 47/12 ft., 1-in. x 1-in., H.W.
Partition, 24/4 ft. 2¾ in., 6-in. x ½-in., T. & G.
Fibro-ciment, sides and doors, 4½ sheets.
Hinges for doors, 4 pair 20-in., 4 pair 18-in., Scotch tee.
Bolts for door hinges, 4 dozen, galvanized, mushroom head.
Turnbuckle handles, 8.
Wire netting, ½-in., 88 yards, galvanized and lacquered.
Laths for trays, 530, 4 ft. broad.
Bolts for sides and runners, 245, 2½-in. x 3-16-in.
T-iron to support centre, 11 ft. 8 in., 1¼-in. x 1¼-in.
Flue, 10 ft. of 8-in., 20-gauge, rolled seam.
Flue, 18 in. diminished from 8 in. to 4½ in.
Flue, outside, with damper, 15 ft. — 4½ in., 22-gauge, cowl on top
Vent pipe, inside, 2/6 ft. 3 in., 22-gauge iron.
Fire-box, ⅛-in. in thickness.
Fire bars.
Fire door.
Cast vent faces for 3-in. vent pipe.
Sliding plates for ash pan.
7-in. vent pipe, with damper, on top of evaporator, 22-gauge galvanized iron.

AMMONIA ACCIDENTS AND EMERGENCY RELIEF.

Accidents sometimes occur in the boiler room or engine room of a refrigerating plant. As the result of such accident, an ammonia pipe may be ruptured, and the vapour spreading, may cause painful injury to the person in the immediate vicinity.

To relieve the suffering and aid the recovery of the victims of an ammonia accident, the following suggestions are given:—

For the Eyes.—First: Pour a 1 per cent. solution of pure boric acid into the eyes, instructing patient to open and close the lids rapidly to bring the solution into contact with the entire inner surface. Use solution freely.

Second: After thoroughly washing the eyes, place a small quantity of clean vaseline under the lids by pulling down lower lid and applying the vaseline with a match-shaped piece of wood having smooth rounded ends.

For the Skin.—Apply lint or linen or wasted muslin, dripping wet with carron oil, changing dressing frequently. By keeping lime-water and linseed oil separately a fresh solution may be prepared each time by mixing thoroughly equal parts of the two ingredients.

For Nose and Throat, if inhaled.—Dip a handkerchief folded once into vinegar, wring out lightly, and place loosely over nose and mouth. If liquid ammonia has entered the nose, snuff up some diluted vinegar, and apply sweet oil with feather to the inner surface and nostrils.

If Ammonia has been Swallowed.—Administer diluted vinegar or have patient suck orange or lemon juice in liberal quantities, and follow with one to four teaspoonfuls of sweet oil, milk, or the whites of three eggs and ice. If any vomiting, aid it by giving liberal draughts of lukewarm water.

General Information.—Ammonia vapour is lighter than air, and on being released it rises. Therefore, in the case of an accident, keep your head as low as possible.

On going to the rescue of one overcome with ammonia vapour, keep near the floor, and place a wet sponge or cloth over the mouth.

Keep the following supplies on hand:—

- A 1 per cent solution of boric acid.
- A bottle of clean plain vaseline.
- A package of surgeon's lint or muslin.
- A package of plain gauze.
- A bottle of best quality vinegar.
- A bottle of sweet oil.

Linseed oil and lime water, to make carron oil.

—Extract from *Refrigerating World*

INSECT PESTS OF THE FRUIT, FLOWER, AND VEGETABLE GARDEN.

AND HOW TO TREAT THEM.

By C. French, Jr., Government Entomologist.

The varieties of insects which attack plants are numbered by thousands; many are distributed all over the world; others, again, are strictly local. At certain seasons, principally in the hot and dry weather, they practically eat everything before them, and in some countries cause famines. Many insects which formerly lived on our native plants have adapted themselves to altered conditions, and now live on cultivated plants. Take, for instance, the apple-root borer, one of the worst pests with which orchardists have to contend. These insects formerly lived on wattles (acacias), but are now the cause of apples, pears, vines, and other plants dying. Another insect, the painted apple moth, which also used to feed on the leaves of wattles, is becoming a serious pest to all kinds of fruits, as well as garden and other cultivated plants. The principal causes for this change of habits are the clearing of land where formerly their natural food plants grew; and the destruction of insectivorous birds, which are often ruthlessly destroyed by boys, or by the poison which is laid for rabbits and other vermin.

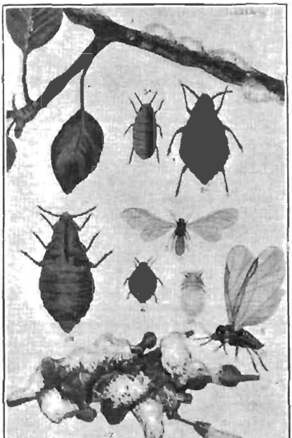


Fig. 1.—Woolly Aphis, or American Blight (*Eriosema lanigera*).

Unfortunately for Victoria, birds introduced from other countries, the starling and the sparrow, and other species, are the cause of valuable insect-eating birds, as kingfishers, diamond birds, tree creepers, and tree swallows, being driven out of their nesting places in tree hollows; and it will not be very long before these useful birds disappear right out of the State.

The insect pests of our orchards and gardens may be divided into two classes, viz., chewing insects and suctorial insects. The former

should be controlled by internal poisoning, and the latter by contact sprays.

Woolly Aphis, or American Blight.

The woolly aphis, or American blight, is one of the most troublesome pests that apple-growers in Victoria have to contend with. It is peculiar in its habits, as it attacks only certain varieties of apples—immune varieties being the Winter Majetin, Northern Spy, Perfection, Paradise, and a few others. The supposed reason of this is, that they contain more carbonate of lime than those attacked by the aphis. It is advisable, therefore, that orchardists should have their trees worked on blight-proof stocks, otherwise the aphis will attack the roots in such a manner as to render the eradication of the pest impossible. All infested trees should be removed, as it is impossible to permanently cure them. The aphides secrete a white, woolly substance, which gives them their characteristic appearance; they attack the trunk and limbs wherever they have been wounded or scratched. Almost all parts of the tree are attacked, and knots and aborted growths are caused. The roots attacked develop great lumps many times the thickness of ordinary roots, and the trees are considerably injured thereby. The root-infesting form can be kept in check by the use of manurial insecticide or tobacco dust worked into the soil. During the winter, or in late autumn, spraying the trees with red oil, kerosene emulsion, lime and sulphur, or fluid insecticide has given good results. Spraying should be done after pruning, and when the trees are bare of leaves. Of course, spraying could be done with advantage at all times, except with the oils.

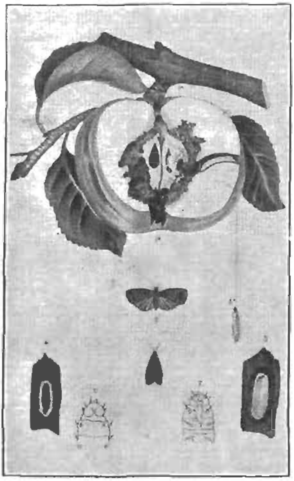


Fig. 2.—Codlin Moth (*Cydia pomonella*).

The Codlin Moth.

This moth, originally a native of Europe, has spread over the whole world, and there are now few countries where apples, pears, and apricots are grown in which this destructive pest is unknown. The female moth places her eggs, as a rule, on the sides of the fruit and leaves. The eggs are thin, transparent bodies, resembling a fish scale. Only one egg is placed on each apple, but as each moth lays over 100 eggs, we may judge the amount of damage done in an orchard. As soon as the

little caterpillar escapes out of its eggshell, it crawls over the apple and when it has reached the eye, it has finished the first stage of its journey. During the first week or ten days after the apple blossoms have fallen, the separate parts surrounding the eye of the apple remain pointing outwards, but later on close up to some extent over the eye. The statement that the majority of grubs go in at the eye has frequently been challenged, but it is nevertheless correct.

The grubs, when fully grown, leave the fruit, and this is done in two ways: the majority lower themselves to the ground, if the fruit has not fallen; others crawl out of the apple on to the branches. Those that fall to the ground re-ascend the tree trunk, and make their way under the first shelter they come to—often under the bark of the apple trees; here they spin cocoons; they then change to the pupæ, and finally the moths emerge in the hot weather. There are supposed to be three broods of this moth, viz.:—(1) The over, wintered or spring brood; (2) the December, or Christmas brood; and (3) the summer, or February brood. Spraying should be done every few weeks during the season when the moths are present. By a judicious use of arsenate of lead, it is no uncommon thing to get a return of 90 per cent. clean fruit. Spraying, to be successful, must be done properly. As fine a mist as possible must be thrown out, so that it may penetrate well into the calyx of the fruit. Bandages, made of hessian, should be placed round the trees to trap the caterpillars, but these must be removed from time to time, and the grubs and chrysalids found therein killed by boiling water. All loose bark should be removed from the trees.

Fig. 3.—Light Brown Apple Moth (*Cacaecia responsina*).

The Light-Brown Apple Moth.

Persons growing flowers, vegetables, and fruit trees have often noticed, especially during the summer months, greenish caterpillars curled up in rose leaves and buds of carnations, dahlias, and chrysanthemums, in fact, in nearly every kind of garden flower. These caterpillars, when fully grown are about 1 inch in length. They are active, and have a habit of dropping to the ground by a silken thread, and hiding in crevices when disturbed. The moth is yellowish-brown, with

slightly barred wings, measuring three-quarters of an inch in length. It is also extremely active, and when disturbed flies to the ground, and remains motionless. The moth deposits its eggs on the young flower buds or fruit, and the eggs hatch in a short time. The young caterpillars at once commence to bore into the flowers or young fruits, and very shortly destroy them. When one bud is eaten out, they leave it and commence on another, and so on until they are fully grown, which usually takes about a fortnight. They then curl up, join a couple of leaves together, and spin a kind of silken web. They next turn into the chrysalis, and hatch out as perfect moths, ready to commence their destructive work in the garden. This pest is very destructive to apples, grapes, &c. I would advise that arsenate of lead be sprayed on the plants. It will poison the caterpillars as soon as they commence to feed. An excellent plan is to place a light on a brick in a dish half-full of water or kerosene at night time in the garden; the light will attract the moths, which will fly against it and fall into the water or kerosene and be destroyed. These caterpillars usually appear in numbers from October to March.

Fig. 4.—Red Spider (*Tetranychus telarius*).

The Red Spider.

The red spider is well known to lovers of flowers. It belongs to the mites, and is, therefore, strictly speaking, not an insect. This species has been found on a great number of fruit trees and on garden and vegetable plants of all descriptions. It is a variable mite, some being almost transparent, others reddish or brick red. When the eggs hatch, the young mites swarm upon the foliage and expanding flowers, and suck up the juices. The plants, vegetables, and other vegetation soon show the influence of their presence by the sickly yellow hue of the foliage. During hot weather, this is one of the worst pests growers of vegetables have to contend with, as they destroy beans, potatoes, pumpkins, and the like. The red spider is not a difficult pest to destroy, as, unlike many other pests, it has no wings, and spreads mainly by the use of its tiny legs. Migration does not extend far from its winter quarters. This makes every growers' problem virtually his own. In other words, if the infestation has always come from a certain fruit tree, plant, &c., proper attention to these will yield results, in spite

of the neglect of his neighbours. The following remedies have been successfully used against these pests: Tobacco water in summer; and, for a winter spray, red oil has given excellent results.

Recent experiments against red spiders on garden and vegetable plants with the insecticide, "Fixo Pest," have been very successful. The plants should be watered slightly before the powder is dusted on the top and underside of the leaves: this prevents the powder from falling from the leaves. The red spiders are usually on the underparts of the leaves, so that the various solutions must be sprayed in an upward direction. Sulphur dusted on the plants may be used with good effect.

THE RUTHERGLEN BUG.

The tiny insect called the Rutherglen bug, or Rutherglen fly, is a true plant bug, and it sometimes appears in countless numbers during the hot weather. During November and December, 1915, and January of this year, these bugs have appeared in millions in most parts of Victoria, and have caused growers of fruit, especially peaches and apricots and tomatoes, considerable losses. The insects were also responsible for the falling off in the honey production of the State, simply swarming in the eucalyptus and other flowers, and abstracting the nectar. Fortunately for orchardists and others who have flower and vegetable gardens, these insects only appear in such vast numbers once or twice in ten or more years, it being about eight years since a similar visitation took place. Like all other bugs, it is furnished with a kind of beak, with which it pierces the flowers and fruits. It then commences to suck the juices; the flowers turn dark-coloured, and the fruit shrivels up. The eggs of this bug are deposited amongst rubbish and weeds, or under the soil. This insect can be kept in check by the benzole emulsion or tobacco sprays. The recent experiments of trying to rid the orchards by smudge fires has been very successful in Victoria and elsewhere. When a gentle breeze is blowing, make smudge fires at intervals amongst the trees, and sprinkle a little sulphur on them. Do not place fires too near trees.

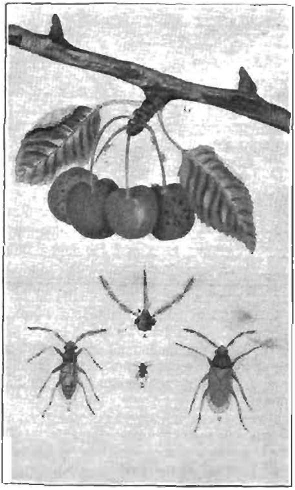


Fig. 5.—Rutherglen Bug (*Nysius vinitor*).

According to Orchard Supervisor G. M. Fletcher, the "Phenyle Spray" was used in the Goulburn Valley this season against Rutherglen bugs with good results—

1 quart phenyle.
3 lbs. washing soda.
1 bar yellow soap.
40 gallons water.

The soap is shredded and dissolved in hot water. The other ingredients are added, and the mixture made up to 40 gallons.

(*To be continued.*)

A NEW PHOSPHATIC ORE.

M. B. De Prelliere asserts in a letter to a French contemporary that he has discovered in one of the departments of France a considerable deposit of a new variety of ore, extremely rich in phosphorus, containing more than 50 per cent. The exact analysis is given as:—Phosphoric acid, 50.10 per cent.; lime, .005 per cent.; silica, 4.75 per cent.; soda, .005 per cent.; free alumina, 8.30 per cent.; combined alumina, 22.80 per cent.; fluorine, 4.15 per cent.; combined water, 5.60 per cent.; loss, 4.79 per cent. The ore was entirely free from potash, iron, and manganese.

An ore of this description should render great service to the chemical industry for the preparation of phosphorus, phosphoric acid, metallic phosphides, and also for the improvement of the manufacture of phosphates.

If it is worth while to extract the phosphorus from bones containing 25 per cent., it should be much more advantageous to obtain it from an inexhaustible ore containing 50 per cent.—Extract *Journ. Ind. & Eng. Chem.*, Dec., 1915.

It is interesting to note that a chemical company has recently been installed in Victoria to work local phosphatic ore deposits. The operations are in the initial stage, but the main product is to be phosphatic fertiliser.

The wonderful Australian wheat crop, now estimated at 150,000,000 bushels, of a money value of £37,000,000, will give heart to those many people in the Commonwealth who have, by reasons of the war, found existence a hard struggle. It will convince them and the world at large of the splendid country we live in, and that if bad times come they do not last long, and that with good seasons we are capable of an indefinite expansion.—*The Australian Review.*

TREE PLANTING.

For City, Town, and Country.

E. Wallis, Orchard Supervisor.

"The making of a bit of God's earth more beautiful for this and for generations ahead."

The above phrase was coined as the title of a picture portraying the work of transformation done in connexion with the Garden City movement at Hampstead, England, and it may also be used to suitably describe the spirit of the article with which we are now dealing.

A view in Botanic Gardens, Melbourne, Federal Government House in the distance.

The subject of tree planting in all its phases well deserves the earnest attention and consideration of every one desirous of creating and maintaining healthier and better conditions for all the community.

If we reflect upon the appearance of a city, town, or even home surroundings without trees, we shall be able, in some measure, to form an idea of the dreariness and severity of such places, notwithstanding architectural achievements of high merit.

The softening influences of trees in streets, parks, and plantations enhance the skill of the architect, and also have a tempering effect upon climatic conditions. Thus it is recognised that the assets of a city are not merely its buildings, commerce, and industries, but also its GENERAL appearance, which has been rightly termed the "outward and visible

evidence of character." "Show me your city or town and I shall tell you the kind and quality of your citizens" is a rule having very apt application when the subject of tree planting is being discussed.

In the United States of America the various municipal organizations endeavour to make their cities healthful and attractive by means of tree-planted avenues and parks. Washington has its beautiful and artistic buildings, but is not noted for these alone. In fact, its chief glory is its splendid avenues planted with rows—some double—of elms, oaks, Oriental planes, and other trees, which make the city like one great park. Brooklyn also has of late years made rapid strides in tree planting, having over 50 parks in which tree cultivation has been made a special feature; in addition, it has over 150,000 trees in the streets. It was in Nebraska that Arbor Day was first instituted, and its celebration annually is adopted in many countries, being productive of much good by inculcating and encouraging in the minds of both young and old a love for trees.

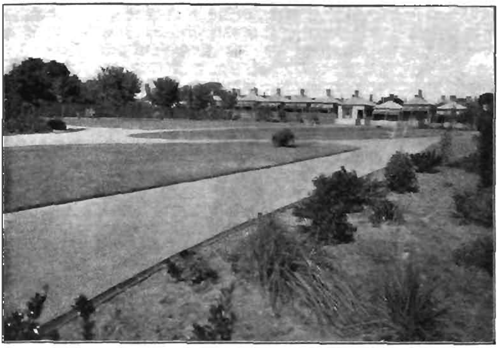
In the vicinity of Melbourne we are very fortunate in having such a fine range of tree-planted park lands, stretching from Albert Park in the south to Royal Park in the north, and including, in addition to these two parks Fawkner Park, The Domain, Botanic Gardens, Flinders Park, Richmond Park, Fitzroy Gardens, Treasury Gardens, Exhibition Gardens, Carlton Oval, and numerous smaller areas planted in recent years.

To the pioneers who, imbued with intelligence and foresight as well as a realization of their responsibility to posterity, acquired these lands and planted them we are indeed grateful. They did their part nobly and well, and the question naturally arises: Are we doing ours in the same way? It is to be feared not.

If we take the suburbs, say, between the 3 and 5 mile radius, we find that the reserves of tree-planted areas are very limited in extent and far removed from each other. It is satisfactory, however, to note that those in authority have in recent years allowed the public free access to tree-planted strips and small reserves by having the fences removed. This good work is much in evidence along Victoria-parade and other places. Realizing that sufficient lungs have not been provided, attempts are being made in some densely-populated localities to reclaim small areas upon which slum dwellings are erected. Where successful, such as at Collingwood, Prahran, and other places, the land has been purchased, the old buildings demolished, and the limited areas secured have been made more healthful and attractive, by being laid down in grass plots and planted with trees, shrubs, and flowers.

The accompanying illustrations show what may be accomplished in this direction of civic usefulness.

On a summer's evening these reserves, situated as they are in the midst of a thickly-populated locality, are thronged with people—young and old—glad to get away from the stifling atmosphere of their houses, many of which are built on areas of less than 1,000 square feet, *i.e.*, 15 feet frontage by a depth of about 60 feet. Such action as this on the part of those responsible is to be greatly commended. The need of it, and the great difficulties to be overcome, both financial and otherwise, in securing even limited areas, should appeal strongly to municipalities and others, and urge them to secure areas for park purposes while they may.



Reclaimed area, densely populated portion of Prahran, one of Melbourne's suburbs.

A breathing space in a densely populated portion of Collingwood, an industrial suburb of Melbourne (Gahan Reserve).

At the present time outer suburbs, such as places in the Heidelberg shire, do not feel the need of parks, owing to the large amount of vacant land. It is, nevertheless, true that this district contains the smallest area of land actually reserved for park purposes of any of the suburbs. What of the future when such districts are densely populated?

Profiting by our experience in regard to the lack of these essentials to health nearer the city, prompt action should be taken, the necessary land secured, and planted with suitable trees, which, as a rule, take a long time to become thoroughly established.

Generations yet unborn would then have reason to sing our praises for our foresight in providing for their needs. It is, in fact, a sacred duty incumbent upon us to perform.

Our Victorian country cities, towns, and districts generally show evidences of the same spirit which dominated Melbourne's pioneers in their commendable efforts to create a healthy and uplifting environment by tree planting. Many of these country centres have their well-established tree-planted public parks and gardens, while the streets are, in many cases, lined with rows of beautiful trees, as shown in the accompanying plates.

In every newly-established country town or district, or in those places that have not seriously considered the question, a definite system of tree planting, both in street and park, is recommended.

It is a worthy work, not only from a local, but also from a national, point of view, always remembering that, in creating these splendid local assets, we are adding to the assets of the State as a whole, and making for the general betterment of life for all.

"Come forth into the light of things;
Let nature be your teacher.
She hath a world of ready wealth,
Our minds and hearts to bless;
Spontaneous wisdom breathed by health,
Truth breathed by cheerfulness."

Utility of Trees.

Not only is there an uplifting influence in the environment of trees, but from a health point of view they are quite a necessity. Therefore, the more tree-planting is adopted the better for the locality concerned.

Without green leaves we would be unable to exist on account of the accumulation of carbonic acid gas from the exhalations of animals and the decay of organic matter.

The office of the green leaf, worthily fulfilled, is to absorb the gas mentioned, and after assimilating those essentials to growth and development, to liberate for our use the life-sustaining oxygen.

"Broader and broader yet their leaves display,
Salute the welcome sun, and entertain the day;
Then, from their breathing souls, the sweets repair
To scent the skies, and purge the unwholesome air."

It is, therefore, easy to understand why it is so necessary, even from a health point of view alone, to have plenty of trees growing in densely-populated cities and towns.

The living conditions of city life are also improved by trees in streets, parks, and gardens by their modifying effect upon the temperature and the added comfort to city dwellers in summer time. The heat in city streets is greatly increased by the radiation from pavements and buildings. The foliage of trees not only prevents the direct rays of sun from beating down upon the streets, but also, by giving off large quantities of moisture by transpiration, the temperature is reduced where it is most necessary.

The establishing of wind-breaks is worthy of more consideration from the farmer, grazier, and orchardist than has been given in the past. Who has not been struck with the desolate wind-swept appearance of some homesteads on the plain country in different parts of the Western District of Victoria, where no shelter belts and trees have been estab-

A leafy elm avenue, Fitzroy Gardens, Melbourne (*Ulmus compestris*).

lished? On such holdings in winter time the stock are pinched up owing to their being fully exposed to cold, biting winds, and in summer time there is no place giving relief from either the direct rays of the sun or the shrivelling effects of the hot winds.

By way of contrast, one only needs to see the splendid shelter belts established near Lismore, Skipton, and other places in the Western District to be at once convinced of the greatly improved appearance, added comfort to man and beast, and the consequent enhanced value of the properties concerned, repaying many times over the expense and trouble of planting and establishing the trees.

The provision of shelter from extremes of cold and heat means much to stock, which soon improves in condition, and yields much better returns than under exposed conditions.

Drying winds have a very detrimental effect upon all cultivated land on account of the greater evaporation of moisture from the soil, and, in addition, orchards often suffer badly through the fruit being severely damaged.

Another factor which principally affects the citizens of Melbourne and suburbs is the dust storms in summer time. Not only is great discomfort caused to residents, but it is estimated that the annual losses to shopkeepers owing to injury to goods runs into thousands of pounds. This dust is not of local manufacture, but is, to a great extent, blown in from the parched plains beyond. Its progress citywards is quite unimpeded by the native timber growing on the outskirts of Melbourne's northern outer suburbs, which is mostly redgum, lacking in density of growth and foliage. If, however, a fairly wide belt of trees, such as *Pinus insignis*, or other suitable varieties of trees, were planted from, say, Heidelberg in the east to the north of Essendon on the west, and thence south-west to the sea front, much good would result in mitigating the dust nuisance by breaking the full force of the blow citywards.

The creation of dust is facilitated by wide roads. Even if well kept, the wind has free play and clouds of dust are the result, but this bad condition is made worse when the roadway is not kept in thorough repair.

Roads that are very wide in and near cities and towns should be divided into sections, and these interplanted with trees; St. Kilda-road, Melbourne, typifies this contention with its sections so arranged.

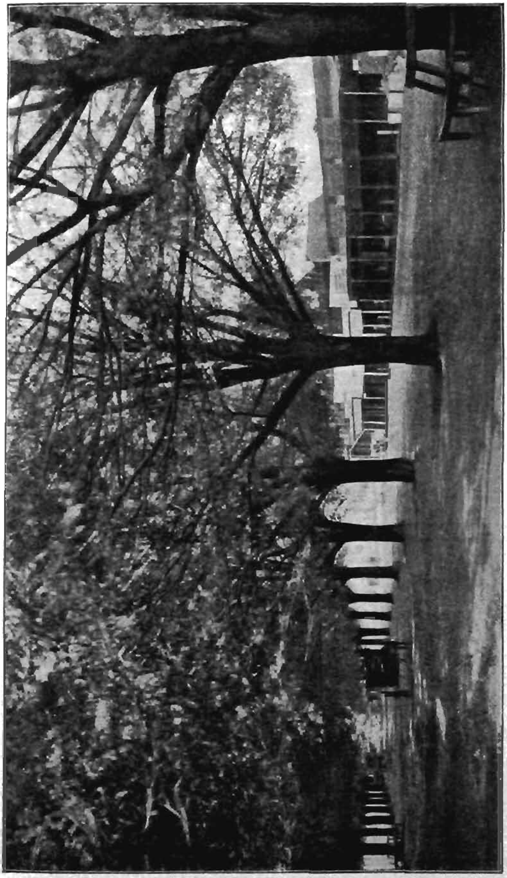
This not only adds beauty to the roadway, but, in addition, the trees provide a breakwind.

Such an arrangement also lessens the cost of road maintenance, and consequently the road surface is kept in a better condition, and the creation of dust minimized.

Selection of Trees.

The choice of suitable trees will, of course, depend entirely upon their allotted position, whether it be in street, park, plantation, private garden, or break-wind. One whose duty is to select trees should be able to see the realization of his objective in, say, twenty, or even fifty years hence. Looking down the perspective of his ideal avenue or street he will see uniformity in every direction—species, distance apart, and general development. Before planting his ideal street trees he will have chosen those varieties having the desirable qualities essential to their well-being. These will include hardiness, which, in the case of street trees, is perhaps the most requisite quality owing to the adverse soil and atmospheric conditions under which such trees have to grow. It is not a case of the survival of the fittest with trees planted in streets, for every tree must be fit and do well. Other necessary qualities for such trees are a clean habit of growth, not making a perpetual state of litter as with some varieties, clean erect stems, power to recuperate after injury or heavy pruning, a fair degree of immunity from the attacks of insects and fungus foes, and a uniform development of crown.

"It has been said that a beautiful boulevard is an unit of a design preconceived, allowing for perfect harmony of arrangement, as in music, where all parts are fitted together to form a harmonious whole."



Elms, Manifold-street, Camperdown.

If all the streets of a town were planted with the same kind of shade tree, or if each were occupied by a mixture, the arrangement would be bad and monotonous; or, on the other hand, if one side of a street were planted with towering elms and the other side with, say, planes, the quality lacking would be individuality, which is most essential to the creation of an environment of imposing grandeur. Mixed planting of avenue trees is undesirable, as it usually creates a patchwork-quilt idea in the observer's mind. Trees of different shape and height with varied hues of foliage suggest natural grouping, and such arrangement should be adopted in the planting of parks and ornamental plantations, but in street planting it is different. The incongruity of a natural arrangement on a city street is easy to understand, as nature did not make the street, neither does she plant trees in straight lines. Avenues of trees are planted because they are useful, but the simple arrangement of an avenue composed of one species or of one variety is also beautiful. Its charm is to be found associated with the things which are naturally dignified in their simplicity.

As we enter such streets or boulevards, call them what we will, varied beauty greets the eye as avenue after avenue, in its arrangement, its mode of growth, and in its utmost simplicity, harmonizes so perfectly with its neighbour as to make discordancy unknown.

The following beautiful and descriptive words have been written on the characteristics of an ideal tree-planted avenue under Canadian conditions:—

"Consider for a moment an avenue composed of four rows of trees, two on each side of the roadway. At all times beautiful, not only in spring with bursting bud, in summer with garb of livid green, or in autumn with russet and gold, but also in winter's mantle of white, for then its beauty approaches the magnificent. Clearly silhouetted against a frosty sky, the very beauty of the trees in their nakedness baffles human expression. Silent as the snow which caresses them, words fail to describe their imperious beauty as queen-like out of the haze they rise to be crowned by the morning sun. An imposing avenue always reminds one of strength. every limb denotes it as it stretches out from the parent trunk in its unconscious grace, every tree in line forming a massive colonnade, silent, majestic, in its very grandeur sublime, and in its sublimity eloquently expressive of its purpose to lead to something dignified."

For street planting it is essential that the choice of varieties be limited to those of a deciduous character. In winter-time such trees allow of the free entrance of sunshine to streets, whilst they are shade-producing during the heat of summer. Surely such arrangement is ideal from an economic point of view.

"From the burning heat of summer
Is offered cool retreat."

To find trees possessing all the desirable qualities which have been enumerated is rather a difficult task, and certainly the range of our choice is limited to a few varieties.

The Oriental Plane (*Platanus orientalis*) probably fills the requirements better than most varieties. It is hardy, resists adverse atmospheric conditions of smoke and dust, is amenable to pruning, and

Oriental Planes, Lyttleton-street, Castlemaine.

Elms, Camp Reserve, Castlemaine.

its recuperative power enables it to make splendid growth and a perfectly symmetrical crown in a single season after pruning. In these days of boulevards and tree planting in connexion with garden cities &c., the Plane finds popular favour, as it did with the Romans and the Greeks many centuries ago. It thrives best in a temperate climate.

Others which possess desirable qualities in a somewhat lesser degree are varieties of the Elm (*Ulmus*), Oak (*Quercus*), and Poplar (*Populus*) families. Perhaps the European Elm (*U. campestris*) and *U. suberosa* are the best of the elms.

The Oak family, although desirable from many points of view, is the host of a troublesome scale insect (*Planchonia quercicola*), which if not eradicated proves fatal to growth and ultimately will kill trees attacked. The Oak thrives best in a cool climate.

The Silver Poplar (*Populus alba*) is worthy of more consideration for street decoration and shade. The opposite page shows a row of these beautiful trees at Sheriff's Bridge, Castlemaine. Both the Poplar and the Elm, in addition to the Oak, like a deep, cool, moist soil.

For park planting the conditions recommended for street trees should apply also to the planting of avenues in parks, with the exception, perhaps, of narrow walks. These should be lined on either side with erect growers such as the Lombardy Poplar (*Populus pyramidalis*). This variety makes a most effective appearance, contrasting strongly with the more spreading varieties. The accompanying plate shows a splendid walk in the Fitzroy Gardens lined on either side with this poplar. The varieties mentioned will also be suitable for general shade purposes.

The requirements of the particular location will, of course, dominate the choice of varieties in other situations. Such qualities as size, shape, colour of foliage, &c., will be considered according to the position and the effect desired. It is also advisable, where possible, to study what trees do well under local conditions of soil and climate. In the hot, dry districts in the northern parts of the State it will be found that the Currajong (*Brachychiton populneus*) and Pepper Tree (*Schinus molle*) do well. The latter, however, is a very gross feeder.

Other trees worthy of consideration in the temperate parts of the State are *Cedrus deodara*, *Cedrus atlantica*, *Cupressus Lambertiana*, *C. Lawsoniana*, *C. torulosa*—the Cupressus family makes splendid wind-breaks and tall hedges—*Jackaranda mimosaefolia* (which likes a sheltered position), *Photinia eriobotrya*, Moreton Bay Fig (*Ficus macrophylla*), Silky Oak (*Grevillea robusta*), Norfolk Island Pine (*Araucaria excelsa*), Weeping Willow (*Salix Babylonica*).

Amongst the Acacia group are to be found varieties splendidly effective, both as to foliage and blossom. The latter quality, however, is not quite desirable in a tree for open park planting, but should be considered in protected plantations, and especially in private gardens. The following rank amongst the best of the Acacias:—*A. Baileyana*, *A. elata*, *A. longifolia*, *A. prominens*, *A. pycnantha*, *A. saligna*, *A. spectabilis*, and *A. verniciflua*.

Break-winds and Shelter.—Amongst our indigenous trees—in fact, we may say any trees—the Sugar Gum (*Eucalyptus cladocalyx*) formerly known as *corynocalyx*, stands out as pre-eminently suitable for planting as a break-wind. It is a rapid grower, attaining under favorable

Silver Poplars, Sheriff's Bridge, Castlemaine.

A Poplar Avenue (Lombardy Poplar, *Populus pyramidalis*), Fitzroy Gardens, Melbourne.

conditions to a height of over 120 feet. In addition, the tree grows well under arid conditions, is of a shapely habit, and the wood is strong and excellent for construction work and fuel.

The Redgum (*E. rostrata*) is a good tree, both for shade and the excellence of its timber. The deep alluvial flats suit it best, where it attains a great size. In hilly country or that of basaltic nature the growth is more restricted, but still produces splendid shade.

Yellow Box (*E. melliodora*), is suitable as a shade tree in warm districts.

The well-known *Pinus insignis* of California will thrive anywhere. It may be found doing well on the plains or even on the summit of Mt. Macedon (which is a pine forest). As a perfect shelter tree this variety is unequalled. Others suitable for dense hedges are *Cupressus Lambertiana horizontalis, C. torulosa, C. macrocarpa, and Pittosporum undulatum.*

Preparation of Soil.

The future success or failure of newly-planted trees depends to a great extent upon the way in which the preparation of soil is done before planting, and also to the amount of attention given to trees afterwards. Especially so is this the case with street trees, because they have, as a rule, to be planted under the most adverse conditions to successful growth and development.

Where soil is not deep, and, it may be, a hard sole exists, the roots of trees are confined to a very small feeding ground. In addition, the roots cannot penetrate the hard substratum, and the moisture of the lower strata for supporting the growth that languishes for want of it in dry weather cannot pass freely upwards in summer time, nor can an excess as during continuous rains pass freely downwards. Thus the roots of trees may at one period be "standing in water," while at another they may be searching in vain for the moisture they imperatively need, and all through the lack of thorough soil preparation at the outset.

For street planting the digging of holes is not as good as preparing the whole length, which, in addition to giving more room for root ramification, also provides for the draining away of excess water.

The ideal mode of soil preparation for a line of trees is to prepare a strip about 4 feet wide along the whole length to be planted. This, of course, means much extra cost in labour, but it is money well spent considering trees are planted to last for many generations, and the better the work is done the longer will be the life of trees and the better the development. A convenient way of preparing the strip is first to remove a section of the surface soil and lay it aside, then break up the sub-soil as deeply as possible, but do not remove it, and upon this may be placed a layer of organic material, such as leaves, &c. Proceed by placing the next section of surface soil upon the broken-up sub-soil, &c., and so on until the end of the length is reached.

For ordinary planting in parks, &c., square holes 4 feet by 4 feet should be prepared in the same way as advised for street planting.

Gelignite is being used as an agent for stirring up the sub-soil, and the results are being watched with interest.

If the soil is composed of miscellaneous rubbish, as is often found in streets, it is well to remove same from the hole and replace with good fresh soil of a loamy character.

Planting.

As trees of a deciduous character are generally received from nursery with bare roots they should be heeled in at once till ready to plant. If this is not done the roots become dried, and the chances are against the tree doing well.

Before planting, such trees should have all injured roots cut off and tops pruned back to make a proper balance between root and top. If this is not done the transpiration through the leaves will be greater than the absorption through the roots, and as a result the tree will become wilted and die.

Staking is also an important item. Tying to guards is equivalent to staking. Once the roots of a young tree take hold of soil, any interference with the tree in endeavouring to straighten it, or in any other way, will injure the newly formed rootlets to the detriment of tree. Assuming then that the hole and young tree are properly prepared, the stake (if necessary) driven into ground, or the guard fixed, the roots should be evenly spread out with their ends dipping into soil—covered with fine soil—and the hole filled in with sweet surface soil, remembering to plant the tree at its original depth in the nursery.

After Attention.

If trees are planted under the most favorable conditions and do not receive proper after attention their future prospects are anything but bright.

Until the trees become firmly established, and, indeed, afterwards, regular watering is necessary during the summer months; injuries to trees require doctoring; pruning needs attention; and insect and fungus pests must be kept in check. When trees are planted they require a thorough watering to make soil compact around roots, and when hot weather sets in this should be done at regular intervals.

Shade trees, growing in streets, are especially subject to mechanical injuries. Where any part of the tree is injured the affected portion should be cleanly severed in order to allow nature to effect her own repairs by means of that wonderful recuperative capacity singular to the vegetable kingdom. There is a latent power in trees which exerts itself on the trees' behalf when part of the tree is injured. Lost parts may be replaced. This power lies in the fact that the tree has many more buds than can be developed in a single season and which lie dormant till some stimulus is produced either by accident or intention in severing some portion of tree.

The pruning of some varieties is necessary and beneficial. By its means a symmetrical development of crown may be secured, and a stimulus given to growth of the tree, but after it has become established no unnecessary interference by cutting should be tolerated as this often proves to be the beginning of trouble in the way of decay, &c.

Insect and Fungus Pests.

Most trees are the host of some particular insect or fungus pest—perhaps both. In the case of ornamental and shade trees the worst

enemies are scale insects and borers. The oak family is very subject to attack from the oak scale (*Planchonia quercicola*), but this, and, in fact all scales, may be kept in check with the oil emulsions which have become so popular as contact remedies for sucking insects. One of the main principles in the successful treatment of scale and other insects of like nature is not to allow them to become firmly established on trees before attacking them. The strength of sprays used will be governed by the kind of tree attacked—evergreens requiring a much weaker strength than trees of a deciduous character sprayed while dormant.

Vigilance is also required with successful treatment of tree borers. As soon as the first boring is noticed a piece of wire should be inserted into hole and grub removed. If this is not possible a small piece of cotton wool, with a few drops of bisulphide of carbon, should be placed in hole which then requires to be plugged with putty, cement, or plaster of paris.

Bordeaux mixture will rid trees of lichen or any fungus diseases which may attack trees.

Conclusion.

It is thus recognised that trees are essential to our well being, producing as they do health and happiness to all—aptly described "The buildings of God." They are in short not only a local, but also an asset of national importance, whether they be planted in public street, park, or on private land. Therefore tree planting should receive the greatest encouragement from all who realize their duty, not only to themselves, but also to posterity. To walk through our beautiful public parks and gardens, with their delightful shade and ornamental trees, is to be reminded of those men of former days who made tree planting and the beautifying of the landscape their life-work.

It may not be ours to perform such great things as they did, but if we do what we can, in regard to tree planting, both privately and publicly, we shall earn the gratitude of future generations by not failing in our duty to them and to ourselves.

[*Some of the illustrations have already appeared in Journal of Agriculture* for July, 1910, when Messrs. A. W. Crooke and J. Blackburne wrote in a very entertaining and practical manner on a similar subject. —EDITOR.]

RECLAMATION OF PLAIN LAND IN SOUTH GIPPSLAND.

By Temple A. J. Smith, Chief Field Officer.

In the neighbourhood of Foster, and many other parts of Southern Gippsland, there are thousands of acres of land at present put to no useful purpose, excepting that of grazing a few head of cattle. These areas consist of low-lying country covered with ti-tree and small gum scrub—the land in many cases is waterlogged during the winter months. Other portions of the plain country are undulating, covered with a similar growth, and though hilly, are in most cases in need of drainage.

This land, upon appearance, is most uninviting; but, on close inspection, reveals the fact that there is soil present capable of being profitably occupied if the right means were adopted to sweeten and fertilise it.

With this object in view, the matter was taken in hand, and, in October, 1912, the secretary of the Great Southern Agricultural Society wrote to the Minister of Agriculture, requesting that a series of experiments be carried out by the Agricultural Department upon the so-called waste lands in the Foster district. At the same time, a letter was sent from the same source, asking Hon. T. Livingston, M.L.A., member for the district, to support the request.

In September, 1914, the Agricultural Superintendent (Mr. A. E. V. Richardson) visited Foster, and arranged for a variety of experiments to be carried out on 8½ acres of land, which had been placed at the disposal of the Department by Mr. Hugh McDonald, who undertook to drain, clear, and plough the land ready for treatment.

Samples of the soil were taken for analysis, which showed the following:—

Parts in 100,000.

Nitrogen	1,246
Phosphoric acid	41
Potash	59
Lime	60
Magnesia	57
Chlorine	30
Reaction: Slightly acid.	

These figures indicated that the soil was rich in nitrogen, and low in all other food constituents.

The nitrogen content, though abundant in quantity, was probably small in availability, and consequently treatments with lime would be necessary to sweeten the soil and liberate the nitrogen. Phosphates were also required to supply the natural deficiency. The chlorine content was high, indicating a larger amount of salt than usual.

The 8½ acres was laid off into seven plots, and lime and manure applied in the following quantities, in May, 1915:—

No. 1.—Ground limestone, 15 cwt.; superphosphate, 150 lbs.
No. 2.—Ground limestone, 15 cwt.; basic slag, 150 lbs.
No. 3.—Ground limestone, 15 cwt; basic slag, 150 lbs.; sulphate of potash, 40 lbs.
No. 4.—No manure; no lime.
No. 5.—Lime, 10 cwt.; superphosphate, 150 lbs.
No. 6.—Lime, 10 cwt.; basic slag, 150 lbs.
No. 7.—Lime, 10 cwt.; basic slag, 150 lbs.; sulphate of potash, 40 lbs.

On this area, the following mixture of grasses was sown across the plots per acre:—

Rye	20 lbs.
Cocksfoot	4 lbs.
White Clover	1 lb.
Cow Grass	1 lb.
Lucerne	2 lbs.

The plots were inspected on the 18th January, 1916, the result of the treatment being satisfactory. All the plots treated with lime and manures showed a good growth of grasses, excepting No. 4, which, contrary to instructions, was first sown with the mixture of grasses as desired, when, as no germination took place, it was treated with lime 10 cwt. per acre. No better success followed the liming, and Mr. McDonald then applied superphosphates 150 lbs. per acre, the seed then germinating and growing well, though somewhat patchy.

The best plots were Nos. 1, 2, and 7. Plots 1 and 7 had been well tramped by the teams during cultivation, which had evidently improved the land by consolidating it.

Noticeable features of the experiment were that, on the lime and superphosphate treated plots, the rye-grass had made the best growth; while the plots treated with lime, basic slag, and potash had the greatest amount of clover growing.

The Rye-grass and Cocksfoot had grown to a height of 12 inches and 15 inches; and the Yorkshire Fog, which had come naturally from a neighbouring plot, had also made good growth. The Lucerne was disappointing, being practically a failure; and the Clovers were, on the whole, poor.

Low-lying patches were poor, and deeper drainage will be necessary in the future for the best results. Heavier liming would also be advantageous, and annual dressings for some years of superphosphate, basic slag, and potash would considerably improve the land for grazing and cropping.

Mr. McDonald estimates the cost of drainage, clearing, and preparing the land at £8 per acre. This is apparently high, and, as the future development of the plain land depends largely on the cost of drainage, clearing, &c., no effort should be spared to reduce expenditure in this direction.

Efficient drainage is the first consideration, and this should be not less than 3 feet deep, at distances best suited to thoroughly rid the land of surplus water. Wide, open drains would probably be best, as they would not be so liable to fall in, and so avoid the necessity for constantly cleaning out. They are also safer for stock, which are often lost through being unable to get out of narrow drains.

Thorough drainage would probably kill much of the ti-tree and undergrowth, and all the surviving green growth could be cut and burned within a couple of years.

One advantage in the plain country, as compared with other somewhat similar land in other parts of the State, lies in the fact that the peaty portions do not burn deeply, generally to a depth of 6 to 10 inches only, immediately beneath which is a useful claybottom. The timber roots soon rot out, and are then easily grubbed and put together for burning. Were the process of draining and clearing spread over a period of about four years, the cost of bringing this land into use should not exceed £5 per acre, which ought to be a good commercial proposition, as the land would probably be worth considerably more than that sum. Possibly, a small syndicate of people interested in reclamation work of this description, with sufficient capital to purchase machinery—such as traction engines, heavy disc ploughs, &c.—might reduce the cost of development still further. The land will continue to improve for many years, and in time should produce good fodder and root crops.

Other experiments in a small way, conducted by Messrs, Wraight and Thomas on plain land, demonstrate clearly that, once drained and cleared, the land will grow good grasses and crops; and the opening up of these areas would be the means of supporting a large population, and adding materially to the wealth of the district.

ANALYSES AND APPROXIMATE VALUE OF FARMYARD MANURES.

Manure.	Nitrogen.	Potash.	Phos. Acid.	Approximate value per ton.
	%	%	%	£ s. d.
Cattle (solid fresh excrement) ..	.29	.10	.17	0 6 6
Cattle (fresh Urine)	.58	.49	..	0 12 6
Hen Manure (fresh)	1.63	.85	1.54	1 14 0
Horse (solid fresh excrement) ..	.44	.35	.17	0 10 0
Horse (fresh urine)	1.55	1.50	..	1 18 0
Sheep (solid fresh excrement) ..	.55	.15	.31	0 10 0
Sheep (fresh urine)	1.95	2.26	.01	2 11 0
Swine (solid fresh excrement) ..	.60	.13	.41	0 10 0
Swine (fresh urine)	.43	.83	.07	0 15 0

The value per ton as given should be taken as the value on the farm. No allowance is made for the organic matter in the manures; in manuring with natural manures this item may be the most important. If the manures are air-dried or rotted with special precautions, the percentages of plant foods increase, with a consequent increase in the value per ton.

The comparative high value of the liquid excrement is well worthy of note. Wherever possible this should be saved, preferably by running it on to an absorbent or the solid manure, and subjecting it to the drying action of the atmosphere.

The value of the mixed manure would be greater than the solid matter only.

SORE SHOULDERS IN HORSES.

A veterinarian gives the following advice for sore shoulders in horses:—A simple application is a lotion made up of zinc acetate 1 drachm, water 1 pint; dabbed on the sore place daily with a piece of cotton wool. This lotion acts as an astringent and antiseptic dressing. When the trouble is more serious, and matter has formed, a preliminary application of tincture of iodine should be made. The best preventives of sore shoulders are cleanliness, good condition of the teams, and well-fitting collars.—*Auckland Weekly News.*

THE SOCIAL SIDE OF FARM LIFE.

By A. Strahan, Editor.

The increasing cry "Back to the Land," in the more densely-populated countries of the world, finds its counter part, even in these newer countries of Australia, where much pioneering work has still to be accomplished. If we examine the census record of Australia we find a great disproportion of rural to city dwellers, the greater number congregating in the capital cities of the Commonwealth. The causes are many, probably the most potent being the amount of money necessarily expended at the seat of government to exploit the inland territories. Consequently manufacturing establishments have sprung into being in these centres, necessitating the employment in various capacities of great numbers of men. The attraction of city life has ever been the lure of the dweller on the land. The more intelligent see the way to easier conditions of life, their children have better opportunities for education, and they themselves enjoy the relaxations of civilization that all crowded cities afford. Of course it can be argued that the city is not as healthful as the country, but in this country at least that factor is probably a more negligent one than in countries which do not possess such a climate as we are fortunate enough to enjoy. Our health resorts do not advertise their hours of sunshine to make them attractive to the weary and holiday seeker. One common luxury enjoyed by city and country dwellers alike in Australia is this self same health bringer, sunshine. We all enjoy it whether we be in the country or crowded city. In one way this places a further burden on those advocating the "Back to the Land" cry, for there is no use in advocating the glorious sunshine of the country against the murk of the city. And so we begin our argument in pushing the claims of country life against those of the city with a heavy handicap. The purpose of this article is not to attempt to prove the impossible; it is frankly admitted that the attractions of city life are all too overwhelming. An attempt is to be made to point a way so that country life may be made much more attractive and appeal to a greater number of people. Let us begin with a maxim. Civilization after all is only a large number of people living sanely and helping each other to resist those natural feelings that make for neglectful living. The starched shirt has more significance than most unthinking people give it credit for. Discipline is the guardian of civilization.

Now that the question of settling those of our returned soldiers on the land is assuming a definite shape, it behoves us to seek means of ameliorating the conditions that a rural life entails. In Australia, in most of the parts, that will be the scenes of the future labours of many of the warriors who have laid down the pen for the sword, and beaten their military weapons into agricultural implements, pioneering work has been accomplished. No longer is it necessary to live hard and to die hard if need be. The factors lacking to make the movement a success are those amenities of civilization that such men have, in a measure, enjoyed before the blue skies and the wide spaces called them. The older generation of pioneers "shunned delights and lived laborious

days," in most cases they knew no other life, but here we are confronted by those who know of other things. A notable example of what may be done to make the rural life brighter and more attractive is furnished by the National Grange of the United States. The Order of Patrons of Husbandry, popularly known as the Grange, was founded in 1867, and has been in existence almost fifty years. It reached the height of its power in 1874, and afterwards declined in influence, and was in the shadow of obscurity until 1880. Since then it has steadily recovered, until to-day it is said to have a membership of 1,500,000. Its temporary collapse was largely due to its endeavour to play a part in the "maelstrom of American politics," and its recovery dates from the time when it began to confine its attention chiefly to various phases of the rural betterment movement.

The aims of the Grange to-day are mainly in the direction of social amelioration and the dissemination of agricultural knowledge. It also takes a keen interest in all educational matters. Its activities include picnics, or dances, where refreshments and all kinds of entertainments are furnished, and where the families of farmers learn to know one another. One of the officers of every Grange Lodge is the lecturer, whose business it is to provide for lectures, papers, and discussions, or all sorts of agricultural and other subjects. The idea with modifications to suit local conditions may be recommended to our farmers. In countries like this, where population is sparse, and homesteads are placed at great distances from one another, the head of the household is apt to forget that, while his own constant occupation with farm work and his keen interest in the development of his property are sufficient to keep him busy and contented, the same does not always apply to the women folk and young people. They feel the monotony and loneliness of rural life. No woman will be happy who does not have reasonable opportunity for intercourse with other women. Young people cannot be expected to settle contentedly in a life where they cannot mix with others of their own age. Perhaps the aims of the American Grange are too ambitious for us to imitate, but it would be an excellent thing if social gatherings of farmers were much more general and frequent than they are at present. The installation of the telephone from homestead to homestead, the establishing of a farmers' club, where both men and women could become members, and definite efforts for making the present meetings of farmers' associations more useful and attractive, are some of the means whereby salvation could be wrought. Papers by members, with discussions, as well as lectures by experts, might be more often arranged, and other members of the family, besides the farmer himself, might be encouraged to attend, with advantage in the social direction. Too frequently three or four farmers travel long distances to meetings, only to find the attendance so small, and the agenda paper so uninteresting, that they feel the time has been almost wasted. An interesting example of what might be done is afforded by the Nhill Pastoral and Agricultural Society which conducts "Farm Competitions" every year with advantage to all concerned. Perhaps it is sufficient to throw out the idea, and if farmers think it over, and are satisfied that there is something in it, they are quite capable of evolving plans to put their wishes into effect.

In many districts the machinery and engine are there, the fuel however is lacking. A competent secretary as engine-driver will soon have the wheels of social life moving.

NOTE ON LAMBS FOR EXPORT.

By A. J. Black, Commonwealth Meat Inspector.

In Victoria, the lamb season generally starts about September or October. If the season has been a good one, and prices favorable, it has started sometimes about August, but more often the former months. It is a noteworthy fact that the first lots of lambs, and they are generally in small lots, arrive in good condition; they kill well, the "bloom" being very noticeable. As the season advances, and the weather becomes warmer, with its usual discomforts—long distances, tightly-packed trucks,* considerable length of time on journey, sometimes two days or more at a "works" before being killed—the depreciation in the carcass is most marked. Lambs that were originally prime, or in good condition, and would have been put into 1st grade—"Approved for Export," find their way into 2nd or 3rd grade—"Passed for Export." There is a double loss. The buyer has to make an allowance for the depreciation that he knows will set in from the time they leave their native pastures and their arrival at the "works"; and if they have to wait for a couple of days before being killed, their depreciation is further accentuated. The difference between the carcass of the early lamb and the "late one," is: The first sets quickly, and in the crossbred, which is the general type of lamb exported, the dry, bright, white colour is intensified. In the "late," it sets slowly, the "bloom" is gone, and the carcass presents a dull, lustreless appearance; and, although freezing bleaches it to a certain extent, there is a difference between the two. The first lamb is carried by the railways in the slack time, and has thus a better opportunity of arriving at its destination in, comparatively speaking, short time. The other is carried in the busy season—the wheat, fruit, and lamb season being on at the one time.† The same sort of conditions prevail in South Australia and New South Wales, and just so long will there be the same possibilities of depreciation. It is pretty safe to assert that 90 per cent. of the rejects among lambs—and during a long, hot spell they are considerable‡—are due to the above-named conditions; and, although plenty of fresh water is always available at works, it is generally in troughs. Lambs will drink from a dam or running water, but they will splash and drink very little from a trough.

In New Zealand, the season starts, in the North Island, about November; and in the South Island, a month or so later, but not in earnest till about March, and continues till August—this is in ordinary years. It is very doubtful if lambs travel a longer distance than 100 miles; there may be isolated instances, but it is certainly not the rule. I am referring to railway journeys—far greater numbers arrive by road than here. The lambs are treated in the winter time,§ thus

* When our winter has been a good one, and the lambing therefore heavy, lambs must be handled in large numbers at the junction of spring and summer, and when placed in close sided, iron and wooden wheat trucks, whether the train is in motion or waiting at a station, the heat in our busiest seasons is intense, and, excepting when works are blocked through strikes, this was the most discouraging feature against quality met with from farms to works.

† In our heaviest lambing seasons, in all sorts of trucks, it is worse still in New South Wales.

‡ Yes; if the lambs are a fairly even lot. In Victoria lambs are bred from all sorts, early and late, and farmers sell everything good and bad for slaughter, selling at a lower rate. I understand in New Zealand such lambs are rejected before coming up to the butcher, and sent to the sale yards, and come later on fit for export.

§ Our lambs are produced in the winter and fattened in the spring and early summer.

there are not the same possibilities of depreciation as in Australia. From the Bluff to Belfast or Islington—the most northerly freezing works, with the exception of Petone—is between 200 and 300 miles, and there are in that space ten freezing works. In the North Island, where the distances to be travelled are longer, the heat is not so intense as in Australia; and if my memory is right, the longest distance between freezing works is between Longburn and Petone, somewhere about 100 or 120 miles. If rams were mated about November or December,* the lambs would come in about August or September. This, with the establishment of freezing works† nearer the supply centres, with railways to the nearest port of shipment; shelter or shade at freezing works, with water in dams or races; small paddocks, where the lambs would rest better than in large paddocks; trucks with doors at the end and opening into its fellow, instead of at the side, such as at present, would, I believe, be a step towards a mitigation of the losses that happen pretty well every season in Victoria.

Another matter that might be brought under the notice of the lamb raiser is the characteristics of the various crosses, and the type of ram that ought to be used. As an instance of the value of the latter, let me cite the following:—I had my Christmas holidays with a relation. He reared a few lambs, and was using Romney Marsh rams on ewes the product of Romney Marsh rams and Merino ewes. Now, I think it is generally admitted that the value of the Romney Marsh is: (1) Its immunity from foot rot; (2) The ewes are strong, big-framed, and roomy; (3) They are good mothers. But, from the ram side of the question, they have some of the faults of the Lincoln, certainly in a lesser degree. They do not mature as quickly as other breeds, and the lamb has not that conformation that one looks for in an early lamb.

The Merino is not to be thought of as a cross for early lamb raising, and when mated with any other ram than the Border Leicester,‡ the lamb throws back to the Merino. The most general crosses met with in a freezing works are the Border Leicester and English Leicester.

The former, owing to the smallness of the head§ is less liable to losses in lambing than the English Leicester—the lamb matures early, fattens quickly, and is the possessor of a good skin. It is also the coarsest cross; it carries a higher percentage of fat than any other; and is inclined to be leggy, and on this account does not show that nice covering of fat where it is so essential. The English Leicester does not grow and mature as quickly as the Border Leicester, and, in fact, is rather slower all round; yet it does not carry such a high percentage of fat; it has a good skin. The Shropshire, when mated with good, roomy ewes of the Lincoln cross, produces a good lamb, which matures and fattens quickly; but in New Zealand has been discarded a good deal for the Southdown. A very compact, nuggety type of lamb is produced, deep in the shoulders; it has a poor skin, comparatively speaking. The Southdown, when mated with second cross ewes, or large-framed sheep of the Lincoln or Romney Marsh breed, is unequalled

* As a rule only merino and fine crossbred ewes come in season during November and December in Victoria.

† In Victoria the supply of labour has to be considered; it is not available where lambs are produced. In New Zealand butchers and other hands live nearer the works. This work continues over a good part of the year.

‡ Border Leicester more suitable than very woolly, excessively covered merinoes, not necessarily all merinoes.

§ *Not so much head, often has deep rugged fore quarters,* high wither, and prominent point of brisket, a matter which can be reversed by selection.

for producing early lambs. They are short, compact, fine in the bone, the minimum of fat with the maximum of flesh, and small neck; they mature quickly, and are very prolific; skin, only fair. Their great drawback is, they will not stand a set-back when stinted in feed at the commencement. They will not carry over, as hoggets or ewes, for breeding purposes; yet, in the Hawke's Bay district of New Zealand, they are largely used. The following are the results of an "experiment" held in New Zealand, indicating the maturing qualities of the various breeds:—The Southdown gave 96 per cent. of first-grade lambs; the Border Leicester, 93 per cent.; the Shropshire, 89 per cent.; and the English Leicester, 86 per cent. While the fecundity of the same was:—Southdown, 130 per cent.; the English Leicester, 128 per cent.; Shropshire, 126 per cent.; the Border Leicester, 120 per cent. The comments in the footnotes have been made by Mr. H. W. Ham, formerly sheep expert to the Department to whom the article was referred.

VERNACULAR NAMES OF VICTORIAN PLANTS.

Communicated by Alfred J. Ewart, D.Sc., Ph.D., Chairman, and C. S. Sutton, M.B., Ch.B., Secretary of the Plant Names Committee of the Field Naturalists' Club of Victoria.

Continued from page 186, Vol. XIV. (10th March, 1916).

Botanical Name.	Popular Name.	Use or Character.
	SYMPETALEÆ HYPOGYNÆ.	
GENTIANACEÆ.		
Villarsia—		
reniformis, R.Br. ..	Yellow Marsh-Flower ..	Might be worthy of cultivation in garden ponds, &c.
Limnanthemum—		
geminatum, Griseb. ..	Large Marshwort ..	
crenatum, F.v.M. ..	Wavy Marshwort ..	
Sebaea—		
ovata, R.Br.	Yellow Sebaea	They all contain more or less a bitter tonic principle, which is sometimes used in domestic remedies.
albidiflora F.v.M. ..	White Sebaea	
Erythraea—		
australis R.Br. (spicata). Persoon	Austral Centaury ..	
Gentiana—		
quadrifaria, Blume ..	Dwarf Gentian	
saxosa, Forster ..	Mountain Gentian ..	
LOGANIACEÆ.		
Mitrasacme—		
montana, Hook. f. ..	Mountain Nitrewort ..	Of no known economic value.
serpillifolia, R.Br. ..	Thyme Nitrewort ..	
pilosa, Labill.	Hairy Nitrewort ..	
polymorpha, R.Br. ..	Varied Nitrewort ..	
paradoxa, R.Br. ..	Curious Nitrewort ..	
distylis, F.v.M. ..	Tiny Nitrewort	
Logania—		
ovata, R.Br.	Ovate Logania	All more or less worthy of garden culture, more especially L. linifolia.
linifolia, Schlech. ..	Flax-leaved Logania ..	
floribunda, R.Br. ..	Narrow-leaved Logania ..	
nuda, F.v.M.	Rare Logania	
PLANTAGINACEÆ.		
Plantago—		
varia, R.Br.	Variable Plantain ..	Have a slight pasture value, but are practically weeds.
tasmanica, Hook. f. ..	Tasman Plantain ..	
stellaris F.v.M.. ..	Star Plantain	

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	SYMPETALEÆ HYPOGYNÆ—*continued.*	
PRIMULACEÆ.		
Centunculus—		
minimus, L.	Chaff Weed	Of no known economic value.
Lysimachia—		
salicifolia, F.v.M. ..	Willow Lysimachia ..	Of no known economic value.
Samolus—		
Valerandi, L.	Common Brookweed ..	
repens, Persoon ..	Creeping Brookweed ..	
MYRSINACEÆ.		
Myrsine—		
variabilis, R.Br. ..	Mutton Wood	The wood is yellowish, hard, tough, and durable. The plant is also worthy of a place in our gardens on account of its fine foliage.
OLEACEÆ.		
Jasminum—		
lineare, R.Br.	Desert Jasmin .. .	Might be improved by cultivation.
Notelaea—		
longifolia, Vent	Net-leaf Mock Olive ..	Wood hard, close-grained, and firm.
ligustrina, Vent. ..	Privet Mock Olive ..	Wood hard, close-grained; used for mallets, turnery, &c.
APOCYNACEÆ.		
Alyxia—		
buxifolia, R.Br. .	Sea-box	Useful for hedges in the coastal districts, also as a garden shrub.
Lyonsia—		
straminea, R.Br. ..	Twining Silk Pod ..	A good climbing plant. The fibre of the bark is fine and strong.
ASCLEPIADACEÆ.		
Sarcostemma—		
australe, R.Br.	Caustic Bush	A reputed poison plant.
Pentatropis—		
quinquepartita, Benth. ..	Purple Pentatrope ..	Of no economic value.
Tylophora—		
barbata, R.Br.	Bearded Wort-flower ..	
Marsdenia—		
flavescens, Cunn. .	Yellow Doubah ..	
rostrata, R.Br.	Stalked Doubah ..	
Leichhardtiana, F.v.M. ..	Doubah Doubah ..	The milky unripe fruits of this plant were eaten by the aborigines.
CONVOLVULACEÆ.		
Convolvulus—		
erubescens, Sims ..	Maiden's-blush Bind Weed	Is apt to become troublesome in arable land.
Calystegia—		
marginata, R.Br. ..	Forest Bindweed ..	Might be improved by garden culture.
sepium, R.Br.	Larger Bindweed ..	
Soldanella, R.Br. ..	Sea Bindweed	
Dichondra—		
repens, R. and G. Forster	Kidney Weed	Of no known economic value.
Cressa—		
Cretica, L.	Rosin Weed	
Wilsonia—		
humilis, R.Br.	Silky Wilsonia	
rotundifolia, Hook. ..	Round-leaved Wilsonia ..	
Backhousii, Hook. f. ..	Narrow-leaved Wilsonia ..	

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	SYMPETALEÆ HYPOGYNÆ—*continued.*	
CONVOLVULACEÆ—*continued.*		
Cuscuta—		
australis, R.Br.	Austral Dodder	Parasitic plants, which strangle other native vegetation, but so far do not appear to attack cultivated plants to any great extent, in the way the European dodder does.
tasmanica, Engl.	Tasman Dodder	
SOLANACEÆ.		
Solanum—		
nigrum, L.	Black Nightshade	A troublesome pest in gardens and cultivated grounds.
aviculare, G. Frost	Kangaroo Apple	The fruit when perfectly ripe is edible and might be improved by cultivation.
var. vescum, F.v.M.	Gunyang	
simile, F.v.M.	Quena	The fruit can be eaten, but in small quantities only.
esuriale, Lindl.	Oondoroo	
xanthocarpum, Schrad.	Toothed Nightshade	Useless and troublesome plants
pungetium, R.Br.	Hairy Nightshade	
lacunarium, F.v.M.	Desert Nightshade	
Lycium—		
australe, F.v.M.	Austral Boxthorn	Of no known economic value.
Nicotiana—		
suaveolens, Lehmann	Austral Tobacco	It is a reputed poison plant and possesses narcotic properties like ordinary tobacco.
Anthocercis—		
myosotidea, F.v.M.	Small-leaved Rayflower	These are suspected poison plants.
albicans, Cunn.	Grey Rayflower	
Eadesii, F.v.M.	Large-leaved Rayflower	
SCROPHULARIACEÆ.		
Mimulus—		
gracilis, R.Br.	Slender Monkeyflower	Might be improved by garden culture.
repens, R.Br.	Creeping Monkeyflower	
prostratus, Benth.	Large Monkeyflower	
Mazus—		
Pumilio, R.Br.	Swamp Mazus	Of no known economic value.
Morgania—		
glabra, R.Br.	Smooth Morgania	Might be improved by garden culture.
floribunda, Benth.	Blue Rod	
Gratiola—		
pedunculata, R.Br.	Stalked Gratiola	Of no known economic value. G. peruviana is a reputed poison plant.
peruviana, L.	Brooklime Gratiola	
nana, Benth.	Dwarf Gratiola	
Glossostigma—		
Drummondii, Benth.	Common Mudmat	Of no known economic value.
elatinoides, Benth.	Lesser Mudmat	
Limosella—		
aquatica, L.	Common Mudwort	
Curdieana, F.v.M.	Larger Mudwort	
Veronica—		
densifolia, F.v.M.	Alpine Speedwell	Of no known economic value.
perfoliata, R.Br.	Digger's Speedwell	Worthy of garden culture.
Derwentia, Littlejohn	Derwent Speedwell	
nivea, Lindl.	Mountain Speedwell	
gracilis, R.Br.	Slender Speedwell	Of no known economic value.
distans, R.Br.	Coast Speedwell	
calycina, R.Br.	Cup Speedwell	
plebeja, R.Br.	Eastern Speedwell	
notabilis, F.v.M.	Forest Speedwell	
serpillifolia, L.	Thyme Speedwell	
peregrina, L.	Wandering Speedwell	
Euphrasia—		
collina, R.Br. (E. Brownii)	Purple Eyebright	*Parasitic on roots of grasses, &c.*
scabra, R.Br.	*Yellow Eyebright*	
antarctica, Benth.	Alpine Eyebright	

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
SYMPETALEÆ HYPOGYNÆ—*continued.*		
OROBANCHACEÆ.		
Orobanche—		
cernua, Loefl.	Common Broomrape ..	Of no known economic value.
LENTIBULARIACEÆ.		
Utricularia—		
flexuosa, Vahl.	Yellow Bladderwort ..	Semi-aquatic plants of no known economic value.
lateriflora, R.Br. ..	Tiny Bladderwort ..	
dichotoma, Labill. ..	Purple Bladderwort ..	
Polypompholyx—		
tenella, Lehm.	Tender Bubble Plant ..	
GESNERIACEÆ.		
Fieldia—		
australis, Cunn. ..	Fieldia	Worthy of garden culture.
BIGNONIACEÆ.		
Tecoma—		
*australis, R.Br ..	Wonga Tecoma ..	One of our finest climbers, well worthy of garden culture.

(*To be continued.*)

CARE OF HARNESS.

Proper care of harness is a needed economy on many farms. It should be hung up in a dry shed when not in use, and not thrown down on the ground, as is often the case. Twice a year, at least, it should be thoroughly washed and dressed with neatsfoot oil. A good dressing for black harness can be made from 2 lbs. mutton suet and 3 lbs. beeswax, melted over a slow fire, 4 lbs. sugar, 2 lbs. lamp black. 2 lbs. soft soap, and ½ lb. indigo powder. When the whole has been thoroughly mixed, half a gallon of oil of turps should be added. If the harness is brown the lamp black and indigo powder can be left out. Copper rivets have their place as a means of repairing harness, but it is a mistake to put these in some places where stitching is necessary. Collars should be well fitting, and it is essential to hang them up when not in use. While there is little danger of sore shoulders when a hard, well-fitting collar is used, if the lining becomes broken it should receive immediate attention. It is better to put a pad above and below a sore than to cut a hole in the collar, but when this has to be resorted to it is advisable to sew the lining so that the body of the collar is kept firm.—*Auckland Weekly News*, 24th February, 1916.

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Government Apiculturist.

XXV.—THE HONEY FLORA OF VICTORIA *(continued).*

(Continued from page 177.)

The Blood Wood (*Eucalyptus corymbosa*, Smith).

(Fig. 45.)

The Blood Wood is a tree not easily confounded with other species. It attains a maximum height of 150 feet, but is often of much lower and sometimes stunted growth, flowering already when scarcely beyond its early shrubby stage.

The bark is persistent furrowed, of a reddish colour, inside fibrous, but rather flaky than stringy, outside rough, grey, and turning black. Bark of the upper branches smooth, and often reddish. The tree exudes kino (gum) abundantly, the whole stem being sometimes covered with this reddish blood-like substance, and hence its popular name.

The timber has a deep red fleshy colour, is porous, and has numerous gum veins; it is easy enough worked when fresh, but becomes very hard when dry. It lasts well underground, and is resistant to termites (white ants), and teredo (sea worm). It is used in fencing and for piles and railway sleepers.

The leaves are scattered on slightly angular branchlets. The leaves vary in size up to 9 inches long and 2 inches broad, of firm consistence, lance-shaped, somewhat curved, or slightly sickle-shaped, paler on the under side, veins very numerous, and very fine, only slightly oblique, the marginal vein close to the edge of the leaf.

The flower clusters occur in sprays forming a nearly flat top, rarely singly at leaf-shoulders, or lateral on branchlets on slender, slightly compressed or angular stalks, bearing three to nine rather large flowers. Buds nearly 1 inch long with flower cup tapering into the stalklet, and a half-round, short, pointed lid. Fruit about 1 inch long more or less urn-shaped, not angular, three or oftener four celled.

The Blood Wood is found in Victoria only in the far eastern part, in the vicinity of the Genoa River.

No Victorian data are available as to its honey-producing value, owing to it not occurring in any present bee-keeping localities. It is, however, considered of some importance by New South Wales apiarists.

The Candle Bark Gum (*Eucalyptus rubida*, Deane and Maiden).

(Fig. 46.)

This tree is also known as Flooded Gum, Bastard White Gum, Ribbony Gum, and Drooping Gum. The name Candle Bark is in reference to the smooth and sometimes frosted or chalky bark of the trunk.

The bark is perfectly smooth for the most part, the outer layers falling off in ribbons. It frequently shows reddish or plum-coloured patches, hence the specific name, "rubida." This colouration, which is generally most conspicuous at the end of summer, is, at times, beautiful when viewed from a distance, ranging from pale salmon colour to bright crimson and purple.

The mature leaves are dull green on both sides, narrow, lance-shaped, and of thickish texture. The veins of the leaf roughly transverse the marginal vein close to the edge. They are often frosted with a whitish bloom. Sucker leaves from nearly round to oblong blunt ended, they are opposite, often stem-clasping, and even sometimes opposite leaves more or less joined round the stem. The buds are egg-shaped, in threes,

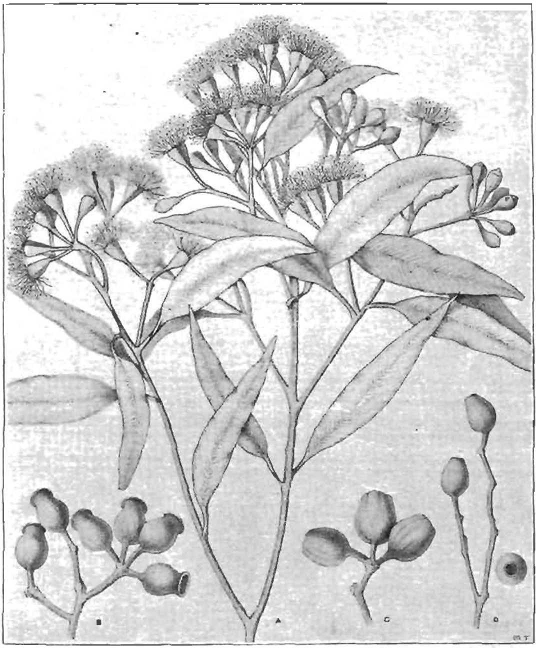


Fig. 45.—The Blood Wood (*Eucalyptus corymbosa*, Smith).

arranged in the shape of a cross, as in the Manna Gum (*E. viminalis*) on short stalklets. Lid of the bud nearly half when mature, hardly pointed. The fruit is top-shaped, spreading at the mouth, sometimes nearly half round, shining or frosted, three or four celled. The timber is red when fresh, but dries pale; it is of little use.

In general appearance, adult leaves and fruits of this tree closely resemble the Manna Gum (*E. viminalis*), in the company of which it is often found. The Manna Gum, however, does not show the colouration of the bark of the Candle Bark Gum, and the latter has round to oblong sucker leaves of lighter green than the lance-shaped sucker leaves of the Manna Gum.

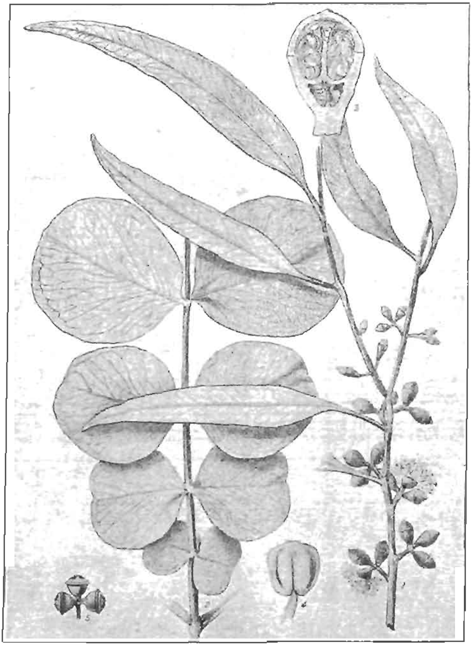


Fig. 46.—The Candle Bark Gum (*Eucalyptus rubida*, Deane and Maiden).
[From Proceedings of the Linnean Society, N.S.W., 1899.]

The Candle Bark Gum blossoms in most localities in January and February, usually a little before the Manna Gum, when the two occur in the same locality. Like the Manna Gum, it is in bud from twelve to fifteen months, two generations of buds being therefore in sight just before it blooms. It yields pollen as well as nectar, and the honey, so far as is known, is identical with that of Manna Gum.

THE SALLOW GUM (*Eucalyptus camphora*, R. T. Baker).

(Fig. 47.)

A small tree, about 20 to 40 feet in height, with a black, shedding bark. Mature leaves, egg-shaped long, abruptly pointed, under 4 inches long, or lance-shaped, pointed, and 6 inches long, somewhat leathery and frosted. The veins are distinct, particularly in young

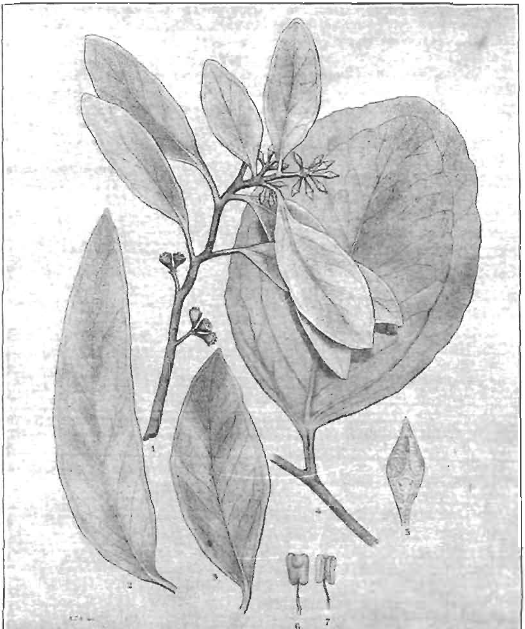


Fig. 47.—The Sallow Gum (*Eucalyptus camphora*, R. T. Baker).

[From R. T. Baker and H. G. Smith, "Research on the Eucalypts, &c."]

leaves, the marginal vein away from the edge. The sucker leaves are egg-shaped (2, 3, 4, Fig. 47), blunt, under 6 inches long, and $3\frac{1}{2}$ inches wide, on angular stalks $\frac{1}{2}$-inch long, leathery, and frosted. The clusters of flowers are few, on flattened stalks at shoulders of leaves, bearing five or six short-stalked, top-shaped, and pointed buds.

The Sallow Gum is usually found in company with the Black Sallee (*E. stellulata*) and the Swamp Gum (*E. paludosa*).

From the Black Sallee it is easily distinguished by its leaves, although otherwise in appearance of growth, branches, bark, &c., the two resemble each other somewhat. Its branches, however, never have that yellow, green colour, which is so characteristic of the Black Sallee (*E. stellulata*), but are of an ashy grey or brownish grey colour, sometimes approaching to a sooty black. From the Swamp Gum (*E. paludosa*), the Sallow Gum is distinguished by the leaves being broader, and more oval, with the end blunt; the leaves on the higher branches approach in shape more those of Yellow Box (*E. melliodora*) than those of any other species.

Incidentally it may here be mentioned that the Swamp Gum (*E. paludosa*) is not essentially a wet ground species, as it also occurs on dry ground, but it grows to a larger and straighter tree than the Sallow Gum.

THE CIDER GUM (*Eucalyptus Gunnii*, Hook, F.)

A shrub or small tree found in Victoria only at high elevations in the north-eastern part, attaining a diameter of 12 inches, and sometimes a height of 30 feet.

The specific name Eucalyptus Gunnii is now only applied to this species, but formerly included the Swamp Gum (*E. paludosa*), the Sallow Gum (*E. camphora*), and the Dwarf Gum (*E. Kitsoni*), all of which are now recognised as distinct species.

The bark of the Cider Gum is smooth. A number of stems spring from a broad expanded root base, a feature which is characteristic of this species.

The leaves are frosted, and variable in size and shape, stem-clasping, stalkless, heart-shaped, round, egg, or egg lance-shaped, and occur opposite or alternate on the rounded branchlets. The lateral veins of the leaves are oblique spreading, the marginal vein well removed from the edge of the leaf. Flowers at shoulders of leaves in short tufts, in threes on a short stalk or stalkless, buds bell-shaped, with short pointed lid, which overlaps the lower part of the bud. The fruit is half-round to cylinder-shaped, with a thickened rim.

A pale-coloured wood. This tree is called Cider Gum on account of a cider-like beverage having been made from the sap.

THE DWARF GUM (*Eucalyptus Kitsoni*, Luehmann and Maiden).

A dwarf tree. It usually does not grow higher than 4 to 5 feet, but at Foster it is found 18 to 20 feet in height. Bark smooth in texture, and ashy grey in colour, lighter in the higher branches.

Juvenile foliage oblong to broadly lance-shaped, with very short stalk, or stalkless leaves, rounded at the end, or terminating in a blunt point, even-sided, and of leathery texture. Veins well marked, spreading marginal vein a considerable distance from the edge of the leaf.

Mature Foliage.—When in the flowering state, this tree has sometimes a few oblong lance-shaped leaves, but they vary in all degrees of width up to 4 inches long by ½-inch wide. Fully developed leaves have the marginal vein close to the edge, and are on stalks up to 1-in. long. Buds with conical lid, the flower cup on a broad (strap-shaped) stalk. Flowers in a head of usually seven, but may be as few as three. Fruit half-round, or more or less conical through mutual pressure, smooth or slightly angled, three, four, or five celled.

The Dwarf Gum grows in poor, boggy country in the low-lying tracts, but also occurs in the drier hills at Foster. The oil of this species is valuable.

The Neglected Gum (*Eucalyptus neglecta*, Maiden).

A dwarf tree like the one previously described, and closely allied to it. It differs, however, from the Dwarf Gum, having broader leaves, smaller, and less angular buds and fruits. It grows in swampy places near the Great Dividing Range, at Omeo.

(To be continued.)

SCIENCE AND AGRICULTURE: A REMARKABLE DISCOVERY.

London papers are publishing a description of a remarkable process by which the vitality of plants has been enormously increased, under experimental conditions, and it is claimed that the process is quite applicable to the production of food on a large scale. Here is the description of what has been done, and probably a great deal more will be heard of the discovery in the near future:—

In a wooden box filled with moss, on the roof of King's College, in the Strand, potatoes are in full growth in October.

Some weeks previously a box, 16 inches long, 6 inches wide, and 4 inches deep, was filled with moss and planted with four potatoes. Once every week the moss was watered with an extract from the bacterized peat, the discovery of which Professor W. B. Bottomley recently described to the British Association. The box, after eight weeks' growth, was as full as it could be of fine new potatoes. Given a little sun, there is no reason, he says, why these vegetables should not be grown in a similar way, not only on the roof, but in one's room if necessary, almost all the year round.

In many cases the size of plants has been doubled and trebled by this treatment. Radishes and tomatoes have even been grown in pure sand watered with the peat extract. Seventy-two cucumbers, weighing 1 lb. each, have been cut from eighteen treated plants after a twenty days' growth, and sold at Covent Garden before those grown in the ordinary way were ready to cut. Sixteen pounds of tomatoes have been taken from one tomato plant. Similar examples of extraordinary growth could be multiplied by the score.

Some time ago Professor Bottomley began these experiments in promoting plant growth by inoculating the soil with the culture of bacteria obtained from the root nodules of leguminous plants. It was found that in soil so treated more nodules were produced in the roots, and that the nitrogenous material in the earth was greatly increased. If the cultures contained humus—that is to say, the black, decaying matter that is found in the soil, they did better still.

"What we then wanted," Professor Boftomley said, "was a source of soluble humus, and we discovered it in peat. We found that by treating peat with special bacteria it was rendered soluble and formed an excellent medium for the growth of nitrogen-fixation organisms."

An important question is whether the discovery can be used for greatly increasing our home-grown food supply. We have seen what it does for vegetables. Will it do as much for wheat?

"There is no reason why it should not," was Professor Bottomley's reply to this question, "if the discovery is taken up and organized on a sufficiently large and authoritative basis. With a definite agricultural policy on the part of the Government, for example, home-grown crops would reap an enormous benefit.

"The whole point is this," he explained. "There are thousands of acres of poor land which could produce plentifully if provided with plant food, and there are, in Yorkshire, in Somersetshire, in Devonshire, and in Ireland, thousands of acres of peat now practically useless, which, by bacterial treatment, could be converted into a rich manure, capable as experiments have shown, at least of doubling the productiveness of the soil.

"Incidentally, it would give Ireland a new industry, for with its practically inexhaustible supplies of peat that country could provide all that would be required for the whole of the rest of the United Kingdom. I am told of one bog alone of 800 acres, where the annual charge is only £20, from which as much peat as one wanted could be obtained.

"Besides the value of peat that has been shown by these experiments there is the fact that ordinary stable manure has been trebled in price in the last two years, and that it is difficult to obtain."

The Government, it is interesting to add, are apparently alive to the importance of the discovery, for they have made a grant to King's College for the purpose of further investigation. Time, however, will be lost if the years are allowed to pass in experiment. The present is the moment for definite action.—*The Farmer's Gazette.*

PROTECTING GUARDS FOR WATERING STOCK.

After trying most kinds of guards for protecting troughing for watering stock, the following has been found to be the most effective and least dangerous:—Put in a row of posts (if split, trim off the splinters) 2 feet in the ground and 10 feet apart, as close as possible alongside the side of the troughing, with a strainer 3 feet in the ground at each end. Have the posts high enough to allow a No. 6 galvanised wire to be run through, so that the wire will be 16 inches above the top of the troughing. Place a good stay at each end, and morticed into the strainer, and strain tightly. The wire so placed will allow sheep to drink under and big stock over the wire. If stock are to drink on each side of the troughing, have the guard on each side.—*Auckland Weekly News.*

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commenced 15th April, 1915; concluding 14th April, 1916.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.2.16	15.2.16 to 14.3.16	Eleven months.	Position in Competition.
		LIGHT BREEDS. WET MASH.				
38	White Leghorns ..	G. McDonnell	1,427	130	1,557	1
34	,, ..	H. McKenzie and Son ..	1,405	119	1,524	2
42	,, ..	W. M. Bayles	1,376	129	1,505	3
2	,, ..	E. A. Lawson	1,368	83	1,451	4
19	,, ..	L. G. Broadbent ..	1,350	89	1,439	5
8	,, ..	C. J. Jackson	1,329	96	1,425	6
23	,, ..	Fulham Park	1,290	127	1,417	7
5	,, ..	J. J. West	1,282	130	1,412	8
59	,, ..	W. G. Osburne	1,285	123	1,408	9
30	,, ..	A. E. Silberelsen ..	1,278	110	1,388	10
28	,, ..	R. Lethbridge	1,270	110	1,380	11
54	,, ..	W. H. Clingin	1,254	125	1,379	12
3	,, ..	J. H. Gill	1,257	106	1,363	13
7	,, ..	Marville Poultry Farm ..	1,263	73	1,356	14
16	,, ..	N. Burston	1,244	106	1,350	15
50	,, ..	John Hood	1,215	122	1,337	16
39	,, ..	W. M. Sewell	1,226	106	1,332	17
18	,, ..	D. Adams	1,212	107	1,319	18
6	,, ..	F. Doldissen	1,216	101	1,317	19
44	,, ..	Mrs. F. M. Oliver ..	1,202	114	1,316	20
9	,, ..	J. Schwabb	1,231	82	1,313	21
11	,, ..	J. B. Brigden	1,219	94	1,313	
58	,, ..	Thirkell and Smith ..	1,195	117	1,312	23
21	,, (5 birds)	E. B. Harris	1,252	56	1,308	24
27	,, ..	J. A. Stahl	1,199	109	1,308	
4	,, (5 birds)	R. Hay	1,194	93	1,287	26
26	,, ..	A. Mowatt	1,197	90	1,287	
22	,, ..	S. Buscumb	1,158	128	1,286	28
20	,, ..	R. W. Pope	1,187	98	1,285	29
32	,, ..	F. Hodges	1,183	102	1,285	
13	,, ..	T. Hustler	1,186	96	1,282	31
15	..	H. N. H. Mirams ..	1,162	116	1,278	32
10	,, (5 birds)	A. E. Tuttleby	1,187	86	1,273	33
43	,, ..	H. I. Merrick	1,175	93	1,268	34
1	,, ..	Mrs. H. Stevenson ..	1,182	85	1,267	35
24	,, ..	Lysbeth Poultry Farm ..	1,166	86	1,252	36
49	,, (5 birds)	Bennett and Chapman ..	1,168	61	1,229	37
33	,, (4 birds)	A. W. Hall	1,141	83	1,224	38
36	,, ..	Weldon Poultry Yards ..	1,129	92	1,221	39
55	,, ..	W. N. O'Mullane ..	1,117	95	1,212	40
60	,, ..	H. C. Brock	1,113	92	1,205	41
41	,, ..	J. A. Donaldson ..	1,102	91	1,193	42
12	,, ..	H. Heyman	1,089	102	1,191	43
46	,, ..	R. Berry	1,080	108	1,188	44
48	,, ..	C. J. Beatty	1,109	71	1,180	45
53	,, (5 birds)	W. G. Swift	1,123	49	1,172	46
25	,, (5 birds)	Giddy and Son	1,117	49	1,166	47
52	,, ..	A. A. Sandland	1,052	104	1,156	48
40	,, ..	C. C. Dunn	1,064	82	1,146	49
47	,, ..	J. C. Armstrong ..	1,093	49	1,142	50
37	,, ..	A. Ross	1,028	104	1,132	51
45	,, ..	South Yan Yean Poultry Farm	1,017	93	1,110	52
57	,, ..	B. Mitchell	1,004	71	1,075	53
14	,, (5 birds)	W. Flood	996	77	1,073	54
31	,, ..	L. McLean	962	91	1,053	55
56	,, (5 birds)	C. Hurst	903	82	985	56
		Total	66,249	5,383	71,632	

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-16—*continued*

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.2.16	15.2.16 to 14.3.16	Eleven months.	Position in Competition.
		LIGHT BREEDS. DRY MASH.				
60	White Leghorns ..	W. H. Robbins	1,418	123	1,541	1
68	,, ..	H. McKenzie and Son ..	1,367	123	1,490	2
76	,, ..	A. A. Sandland	1,213	121	1,364	3
79	,, ..	Lysbeth Poultry Farm ..	1,250	113	1,363	4
63	,, ..	A. H. Padman	1,234	121	1,355	5
62	,, ..	Benwerren Egg Farm ..	1,218	90	1,308	6
67	,, ..	C. C. Dunn	1,175	112	1,287	7
65	,, ..	Thirkell and Smith ..	1,170	97	1,267	8
69	,, ..	E. MacBrown	1,203	61	1,264	9
66	,, ..	E. A. Lawson	1,174	89	1,263	10
61	,, ..	Mrs. H. Stevenson ..	1,156	106	1,262	11
72	,, ..	Mrs. E. Zimmerman ..	1,155	89	1,244	12
71	,, ..	Moritz Bros.	1,160	79	1,239	13
78	,, ..	H. Hanbury	1,113	90	1,203	14
73	,, ..	C. L. Lindrea	1,057	108	1,165	15
64	,, (2 birds)	W. M. Bayles	1,104	46	1,150	16
77	,, ..	South Yan Yean Poultry Farm	1,002	107	1,149	17
74	,, ..	J. H. Gill	893	77	970	18
75	,, ..	Fulham Park	868	69	937	19
		Total	22,060	1,821	23,821	
		HEAVY BREEDS. WET MASH.				
86	Black Orpingtons ..	C. E. Graham	1,302	117	1,419	1
97	,, ..	Marville Poultry Farm ..	1,253	105	1,358	2
89	Rhode Island Reds	E. W. Hippe	1,192	116	1,308	3
92	Black Orpingtons ..	J. Ogden	1,180	122	1,302	4
85	,, ..	H. H. Pump	1,181	110	1,291	5
81	,, ..	Mrs. T. W. Pearce ..	1,177	98	1,275	6
93	,, (5 birds)	L. W. Parker	1,131	94	1,225	7
100	,, (5 birds)	J. H. Wright	1,144	35	1,179	8
88	,, ..	J. McAllan	1,107	64	1,171	9
84	,, ..	Cowan Bros.	1,071	90	1,161	10
91	,, ..	A. Greenhalgh	1,084	61	1,145	11
87	,, ..	W. C. Spencer	1,043	109	1,152	12
96	Faverolles ..	K. Courtenay	1,023	115	1,138	13
99	Black Orpingtons ..	L. McLean	1,063	73	1,136	14
90	,, (5 birds)	Oaklands Poultry Farm ..	1,038	87	1,125	15
95	Silver Wyandottes..	W. H. Forsyth	942	104	1,046	16
94	Black Orpingtons (5 birds)	E. Fisher	926	40	966	17
83	Black Orpingtons ..	G. Mayberry	908	45	953	18
82	White Wyandottes (5 birds)	J. B. Brigden	702	54	756	19
96	White Orpingtons ..	Stranks Bros.	633	21	654	20
		Total	21,100	1,660	22,760	

MONTHLY REPORT.

Weather conditions for the month have been seasonable, and, on the whole, favorable to egg production, though the fact that the wind was from south-east on three occasions was against obtaining the best results.

Some of the birds are now moulting, but hens laying in moult are more noticeable than in previous years. Needless to say, such hens are very valuable.

The average number of eggs per hen right through the competition is 1,244 to date, which is very satisfactory. Temperatures ranged from:—lowest, 47 degrees Fahrenheit, to highest 103 degrees Fahrenheit. Rainfall, 100 points.

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

As soon as the fruit is off the trees, the land should be well ploughed and left in a rough condition until the spring ploughing. If not already done, and the orchard conditions demand it, there is still time to put in a leguminous crop for green manuring purposes. But this should be done as early as possible, so as to give the crop a chance to make some good early growth. Soils deficient in lime or in organic matter are always benefited by a crop of green manures. Where stable manure is unprocurable, the green manure crop is the only means of adding organic matter to the soil.

Pests and Diseases.

All second-hand and old cases should be thoroughly overhauled. It is preferable to do this work now, instead of leaving it till spring, when the rush of other duties will certainly prevent it being carried out. The cases, if not bad enough to be destroyed by fire, should be dipped for some time in boiling water. And this is not only for the killing of the codlin larvæ, but also to destroy larvæ or eggs of any scale or aphis, and also any spores of fungus diseases that may have found lodgment therein.

As soon as the trees have shed their foliage they may be sprayed with red oil emulsion for woolly aphis, peach aphis, and the bryobia mite. And this should be done before pruning, so that in handling and carrying the prunings the pests will not be spread about the orchard to infect the clean portions.

Flower Garden.

The removal of permanent shrubs and palms, and the planting out of evergreen trees, shrubs, and herbaceous divisions should not be delayed any longer. The nursery section of this class should be cleared out into the garden at once. It is a mistake to wait, as many growers do, for the removal of such plants until the winter season. If planted out now while the ground is warm, the roots of the plants have a fair chance to grow, to take a considerable hold of the soil, and to establish themselves in their new location before the growth period ceases. Then, after the winter's rest, they are ready to break away into new growth, both in the roots and crown, with the advent of the first spring weather. When planted in winter they have no chance to grow; the roots remain as when planted, and with every chance to rot in the cold, wet soil, the foliage becomes yellow and debilitated, and the plant, if it does not succumb, often takes the whole ensuing season to recover its general health. And then, of course, the season that has been lost can never be regained.

Bulbs, tubers, and corms of spring-flowering plants should now all be planted. As they appear above ground, they should be protected

from the ravages of snails and slugs, as these pests have a very great liking for these succulent growths. A good surface dressing of broken leaf or dust tobacco will effectually deal with these pests. In fact, the gardener who constantly uses tobacco, either in the leaf, stem, or dust forms, will very soon be in the happy position that slugs and snails will cause him no anxiety whatever. Besides, the tobacco has manurial properties which are also valuable.

Pansy and any other seedlings, also rooted layers and cuttings, may now be planted out into their permanent positions.

Sowings may also be made of any hardy annuals, such as antirrhinum, aquilegia, correopsis, Canterbury bell, dianthus, everlastings, foxglove, gaillardia, hollyhock, larkspur, leptosyne, lobelia, marigold, pansy, petunia, stock, sweet peas, verbena, wallflower, &c.

Vegetable Garden.

There should now be no untidy or undug beds in the kitchen garden. The vacant beds should all be well dug over and prepared for the planting of vegetables for use in spring. In digging, a top dressing of manure should be given; this may be dug in. All weeds, too, may be forked into the trenches, and covered well with soil as each spit or length is dug. A dressing of lime is very beneficial at this time of the year three or four weeks after the manure or weed dressing.

A start should now be made at cleaning out the asparagus beds. This vegetable is most popular, and yet one rarely met with in ordinary household gardens. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed plots in the whole garden. Depth of good soil and plenty of manure are all that this plant requires.

In establishing a new bed, it is advisable to see that there is a good depth of 2 or 3 feet of rich, well-manured soil. If this is not present, the soil should be dug out to that depth, and thoroughly mixed and enriched with well-rotted manure before being replaced. A bed deeply prepared, and supplied with ample quantities of manure, should last without replanting for very many years. The young plants or crowns should then be planted in trenches, keeping the rows 2 or 3 feet apart. An asparagus bed requires ample and direct exposure to the full rays of the sun. The asparagus should not be cut during the first season after planting; in fact, it is better to allow it to go uncut for two seasons. As little foreign weed growth as possible should be allowed in the beds, but, when they are not producing culinary asparagus, rows of lettuce, beans, radish, &c., may be grown between the crowns.

Towards the end of April the tops may be cut down, the beds cleaned, and a good top dressing of stable manure given. Chemical fertilizers, such as bonedust, sulphate of ammonia, and sulphate of potash, may be given as a substitute to organic manure. In the past it has been the custom to annually top-dress the beds with salt. It was supposed that as asparagus in its native habitat was usually found in sandy soils near the sea coast, the plant required salt or a saline soil to produce successful results. It has latterly been found that salt is not at all essential to good growth, and that the plant will readily adapt itself and grow well in soils of not at all a saline character. Where potash has taken the place of salt, quite improved results followed.

It is a good rule to observe that no ripe seeds should be allowed to fall on the beds; they should be stripped off the plants before they have a chance to drop. Seedlings will become a nuisance in the beds, and they interfere with the regularity of the rows.

A few early peas, also some broad beans, may now be sown; cabbage, cauliflower, and other seedlings should be planted out from the seed beds. All garden herbs, such as thyme, mint, horse-radish, sage, &c., as well as rhubarb, should be divided and planted out where necessary.

Onion seeds for an early crop may be planted out towards the end of the month. Brown Spanish is very hard to beat as an all-round onion, while the variety of Early Brown Spanish may be relied upon to produce an early crop.

FRANKLIN'S WORDS OF WISDOM.

Want of care does more damage than want of wisdom. For want of a nail the shoe was lost, and for want of a shoe the horse was lost.

For age and want save while you may, no morning sun lasts all the day.

Experience keeps a dear school, but fools will learn in no other.

Creditors have better memories than debtors.

Plough deep while sluggards sleep; and you will have corn to sell and to keep.

Work to-day, for you know not how much you may be hindered to-morrow.

If you have your business done, go; if not, send.

Foolish men make feasts, and wise men eat them.

He that by the plough would thrive, himself must either hold or drive.

The eye of the master will do more work than his hands.

Always taking out of the meal tub and never putting in soon comes to the bottom.

If you would know the value of money, try to borrow some.

Industry needs not wish, and he that lives upon hope will die fasting.

Buy what thou hast no need of, and ere long thou wilt sell thy necessaries.

At a great pennyworth pause awhile; many are ruined by buying bargains.

REMINDERS FOR MAY.

LIVE STOCK.

Horses.—*Those stabled can be fed liberally.* **Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry.** *Old horses and weaned foals should*

be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Attend to teeth and feet of horses to be turned out for the winter.

Cattle.—Cows, if not housed, should be rugged. Rugs should be removed in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Calves should be kept in warm dry shed. Observe strict cleanliness in feeding to avoid losses and sickness incidental to calf-rearing.

Pigs.—As recommended in Reminders for April.

Sheep.—Keep in-lamb ewes in strong store condition. Best results are obtained when ewes are neither very poor, nor excessively fat. Once the lambs arrive, the most liberal treatment possible is in the main the most profitable. Ill-fed ewes are bad mothers at all times—at the time, or after lambing. Select fine weather for lamb marking. Yard lambs over night. Never castrate or tail high-conditioned or very weak lambs immediately on being run in and over-heated. The risk with large ram lambs will be lessened if they are allowed to stay in the yards an hour or two after castration. Draw the coagulated blood which in many cases will be found retained in the groin and purse, no matter what method of opening the purse is used. Never draw tails tight. Projecting bone delays healing, especially when cutting off with hot blades. Even with the knife leave enough loose skin to come over and check the usual strong rush of blood from lambs on well-fed mothers.

Poultry.—Feed animal food to forward pullets, about ½ oz. daily, and equal parts heavy oats and broken maize at night. Add lucerne chaff to mash daily. See that fowl houses are free from draughts to avoid colds, also that they are free from red mites. Use Epsom salts freely to avoid Roup and Chicken Pox.

CULTIVATION.

Farm.—Dig main crop potatoes. Push on with ploughing and sowing of cereal crops, including peas and beans. Green fodder (as for April) may still be sown. Land for maize, potatoes, and other root crops should be prepared and manured. Flax may be sown. Transplant Chou Moellier and Giant Drumhead cabbage plants in rows 3 feet apart. Complete sowing permanent pastures with grasses and clovers.

Orchard.—Plough, manure; apply lime to orchard lands at rate or 5 or 10 cwt. per acre where soil is sour. Spray trees infested with scale insects, Woolly Aphis, and Bryobia Mite with red oil or crude petroleum. Clean all rough bark from trees. Commence pruning early varieties at end of month.

Flower Garden.—Digging, manuring, and pruning; trench and drain where necessary. Dress the surface with lime. Continue to sow hardy annuals. Bury all leaves, soft-wood cuttings, and weeds. Continue to plant spring blooming perennials and other plants. Plant cuttings of carnations and roses.

Vegetable Garden.—Cut down and clean out asparagus beds. Apply manure and lime dressings. Cultivate deeply. Plant out seedlings and early potatoes; sow peas, broad beans, carrots, and parsnips.

Vineyard.—Subsoil land for new plantations if not already done. This work should be carried out as long before planting as is practicable. Vine-growers are warned against the too common practice of feeding off foliage after vintage. Any small advantage in the form of stock feed is only gained at the cost of a reduction in the following season's crop, owing to interference with accumulation of reserves, which continues so long as the leaves remain green. Sheep should not be allowed into the vineyard until all leaves have changed colour. Early and deep ploughing is strongly recommended. Manures should be applied as early as possible. Peas, &c., for green manuring, should be sown without delay, in order to take advantage of early rains. Applications for grafted resistant rootlings for 1916 must be made before end of May.

Cellars.—Rack or fill up (preferably the former) dry wines as soon as a lighted match, introduced at bung hole, is no longer extinguished. Sweet wines should also be racked and fortified to full strength.

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THE WHEAT CROP FOR 1916.

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I.—RETROSPECT.

Never in our history have the problems associated with the production, marketing, and financing of the Australian wheat crop awakened such lively interest on the part of Governments, politicians, primary producers and consumers. This interest has arisen from the general recognition of the important part played by our staple crop in relation both to Imperial necessities and to home finance.

In 1914, Canada's crop was a partial failure, whilst Australia failed to produce sufficient grain for home requirements. Hence Great Britain was compelled to fill her grain requirements from foreign sources, and send either goods, foreign securities or gold to liquidate the debt.

In 1915, on the other hand, Canada and Australia, thanks to a propitious season, the stimulus of high prices of wheat, and the practical encouragement given to farmers by the respective Governments, seeded a record acreage to wheat and secured the biggest crop on record. This served the twofold purpose of relieving the Mother Country of the embarrassment of dependence on foreign supplies and of assisting the Dominions to meet loan obligations and to restore a favorable trade balance.

In December, 1914, an appeal was made to wheat growers to seed a record acreage in 1915. At the time the appeal was made the pastoral and agricultural industries of Australia were in a most critical condition on account of the drought through which they had just passed.

With both seed and fodder at high prices and labour scarce it seemed somewhat hopeless to advocate large sowings. The outlook, however,

furnished a triple incentive to urge farmers on—

(1) The prospect of good prices for wheat.
(2) The probability of a year of drought being succeeded by a year of abundant winter rainfall.
(3) The necessity of making the crop of 1915 recoup them for the losses of 1914.

The Victorian Government advanced more than £600,000 to cover cost of seed, manure, and fodder to necessitous farmers, and urged farmers to put in as much wheat as possible. The official objective, announced early in 1915, was the seeding of an area of 4,000,000 acres and a crop yield of 50,000,000 bushels. At the time of the announcement the general opinion was that the objective, though laudable, could not, in view of the difficulties confronting farmers, be realized.

The response of the farmers was magnificent, no less than 4,160,000 acres being sown to wheat—an increase of 35½ per cent. over the previous year's acreage. Of this area 3,679,971 acres were reaped for grain.

Owing to the favorable season, the abundant and well distributed rainfall, the Victorian harvest amounted to 58,500,000 bushels.

This response of the farmers was beyond praise. At the same time, had it not been for the bold lead given by the State and the liberal advances made—which incidentally strengthened the whole fabric of rural credit throughout the country—this fine result could not have been consummated. It is an interesting example of the manner in which judicious financial assistance accelerates primary production.

A similar appeal was made to farmers by the Governments of all neutral and belligerent countries to increase the acreage sown to wheat; and it is interesting to note that the response in Victoria was relatively greater, both as regards increase in acreage and increase in yield, than that of any other wheat-growing country in the world. Thus the increase in area in Victoria was 28.5 per cent. as compared with 1914, the previous record; and 63 per cent. above the average acreage for the five years prior to the war. Canada showed an increased acreage as compared with 1914 of 26.2 per cent.; Great Britain, 22.5 per cent.; Egypt, 21.6 per cent.; India, 13.2 per cent.; United States, 10.9 per cent. No other countries managed to secure increases in acreage of 10 per cent. save the British Possessions and the United States.

The full details are set out in tabular form in the appendices. The season of 1915 was exceptionally favorable for wheat-growing, and, as a result, Australia's crop will probably exceed 170,000,000 bushels, thus providing an exportable surplus of 135,000,000 to 140,000,000 bushels—a surplus double that of any two previous consecutive seasons. This following on the heels of the most disastrous drought within living memory is a remarkable illustration of the recuperative power of Australian soils.

Long before this bumper harvest was assured problems relating to the marketing and financing of the crop began to exercise the minds of those in authority. In view of the world-wide shortage of freights and the rapidly rising rates for ocean carriage, the State Governments, acting in co-operation with the Commonwealth Government, decided to undertake the responsibility of financing and marketing the crop and making necessary advances to growers. The details of the Wheat-Pooling Scheme are now well known to farmers.

The principle of the scheme is that the proceeds from the sales of wheat, less marketing and transit charges, are to be divided between the participating growers in proportion to the amount of wheat forwarded. Full market price is secured for all cargoes sold abroad, and a fair price, approximating London parity, viz., 4s. 9d. per bushel, is charged for all wheat used for gristing for internal consumption. Such advantageous marketing conditions, it is now generally admitted, could not have been obtained without Government intervention. It may be said that the resources and credit of the States were used on behalf of the producers to obtain full market value for our staple crop.

Summarized, the position for 1915 is as follows:—Victorian farmers reaped a harvest of 58,500,000 bushels, an equivalent of at least two normal crops. In addition, the f.o.b. price is at least equal to the best f.o.b. price received for the past forty years. If the whole harvest could be sold at current rates it would be worth two and a-half to three ordinary crops. Such, in brief, is the record for 1915.

II.—PROSPECT.

But what of 1916? Will the farmers rest content with the achievement of the past season or will they make another concerted effort for a big crop this year? If we are to judge the question by the amount of preparation and fallowing already done, it must be confessed that the crop prospects for 1916 in Victoria are not bright. In the Wimmera, the Mallee, and the Goulburn Valley the amount of fallowing appears to be far short of the amount normally completed at this season of the year. Scarcity of skilled farm labour is having an inevitable effect on diminution of acreage. Since harvest time many farm hands, farmers' sons and farmers themselves have responded to their country's call and have enlisted. This makes the task for those who remain all the heavier.

Though no effort will be spared by those who remain, the task of maintaining the full area under cultivation on each farm will be indeed difficult, and will call for extra sacrifices and hard work.

Except for the greater scarcity of farm labour caused by generous enlistment in this State the task of preparation is not attended with the difficulties that confronted the farmer last year. Stock are in excellent condition, and there is an abundance of fodder on every farm.

But it is to be feared that the general uncertainty regarding the future of the wheat market may cause growers to limit acreages this year, just as anticipated high prices were a powerful stimulus to extra exertions last year. We have read of the bumper crops in the United States, Canada, Australia, and Argentine in 1915, the enormous wheat stacks awaiting shipment to Europe, the general scarcity of freights, the picturesque advance of our Russian allies through Armenia, rumours of Turkey declaring a separate peace; and it is perhaps hard to resist the inference that prices for our staple crop will slump by next harvest. If such a view is widely held by farmers, it will certainly act as a greater deterrent on large acreages than any other factor.

Consequently I have endeavoured in the following pages to summarize the statistical position of the wheat market, with a view of showing that, though the present statistical position may appear adverse to the producer, the future of the wheat market is hopeful.

The statistics, compiled from official sources, are presented in tabular form in the appendices, and they should be of interest to those who, while anxious to form their own opinions regarding possible future developments, do not care to wade through piles of official statistics expressed in the metric system.

First, consider the world harvest for 1915. In 1915 the world reaped its record crop. The magnitude of the harvest in enemy countries is not exactly known, though it is known that the harvest in Germany and Austria in 1915 was a partial failure owing to unfavorable weather conditions prior to harvest.

Reliable authorities agree that the combined crop of Germany and Austria was not more than 80 per cent. of the normal amount. In addition, there was a serious falling-off in the French wheat crop, the production for 1915 being officially estimated at 243,000,000 bushels as compared with a normal production of 317,000,000 bushels for the previous five years, *i.e.*, a shortage of 74,000,000 bushels. Italy, Japan, and Bulgaria also showed decreases in production compared with the normal.

On the other hand, in all other countries there was increased production compared with the average of the five years prior to the war. In all, the wheat reaped was 4,577,000,000 bushels, compared with 3,816,000,000 bushels for 1914, and 3,944,000,000 bushels for the five years' average prior to the war.

The world's previous best record was 1913, when 4,272,000,000 bushels were reaped—that is to say, the world's production for 1915 is 761,000,000 bushels greater than 1914, 633,000,000 more than the five years' average prior to the war, and 305,000,000 more than the previous record crop. The present statistical position, therefore, seems very favorable for consumers and unfavorable for producers. Indeed, if the whole of this enormous surplus were immediately available and could be thrown on the markets of importing countries, a serious slump in prices would be inevitable.

As a matter of fact, however, the Roumanian and Russian surpluses are locked up in the Black Sea ports and cannot, unless peace is declared, affect the markets. Roumania and Russia have between them a surplus of over 300,000,000 bushels. So long as the Dardanelles are closed this surplus cannot affect the market.

Then, again, the scarcity in freights is producing the same effect as a temporary crop shortage in the importing countries, for operators in America, Argentine, and Australia can only effectively offer, and purchasers abroad will only buy, so much of their surplus as they have secured freights for.

In order to more fully appreciate the present statistical position, consider briefly the needs of the importing countries in relation to the surplus available in the exporting countries (these are summarized in Table III. of the appendix). For the five years prior to the war the average import of wheat was approximately 625,000,000 bushels. Of this, Germany and Austria required 80,000,000, the balance being absorbed by the Allies and neutral European Powers. In view of the shortage of production in France for 1915, *i.e.*, 75,000,000, the total requirements of these importing countries (exclusive of Germany and Austria) are 620,000,000 bushels.

In 1915, the exporting countries have a surplus above their home requirements of 1,330,000,000 bushels. Of this surplus Russia, Roumania, and Bulgaria together account for 320,000,000 bushels, leaving approximately 1,010,000,000 bushels for the United States, Canada, Argentine, India, and Australia. Hence the exporting countries, with a surplus of 1,010,000,000 bushels, are competing with one another for a maximum effective demand of 620,000,000 bushels. Under these circumstances, it seems inevitable that there would be a heavy slump in prices on the exporting markets; yet, strange to relate, no such slump has yet occurred, in spite of the fact that the Northern Hemisphere harvest of 1916 will in three months' time be upon us.

As a matter of actual fact the amount of wheat produced by the bumper crop of 1915 is only 305,000,000 bushels more than the record crop of 1913. But more than 310,000,000 bushels are locked up in the Black Sea, and for present market purposes are as good as non-existent. Hence, at the worst, prices should not be lower than those following on the 1913 harvest.

Moreover, evidence is steadily accumulating to show that the prospects for a big world harvest for 1916 are not bright. It is now known that there has been a considerable shrinkage in acreage sown to winter wheat in the Northern Hemisphere this year; and it is more than likely, judging by the unfavorable weather reports, that the average yield per acre in 1916 will not equal that of 1915.

If these speculations are realized, the statistical position will be very much brighter for the producer.

OBSERVED SHRINKAGES IN ACREAGE.

For example, the official estimates for sowings of winter wheat show a falling off in the United States of 5,000,000 acres, Canada 1,250,000 acres, India 2,000,000 acres—a total falling off in winter wheat alone, in three countries, of 8,250,000 acres. Statistics relating to the spring-sown crop have not yet been published, though reports have been circulated to the effect that the weather conditions have not been favorable for seeding. Assuming a proportionate shrinkage in spring-sown crops, the total area will show a falling off in acreage of, approximately, 11,000,000 acres. Australia and Argentine have not yet (1st April) commenced sowing. So far as Australia is concerned, last year's record increase in acreage was due to the cheap working up of several million acres of crop which failed to mature the previous year. Similar conditions will not prevail this season, and while, of course, we all hope that the acreage sown will be as large as possible, it is almost certain that there will be a shrinkage of at least one to two million acres as compared with last year.

Diminished winter sowings have also been recorded in France, Italy, Great Britain, and Russia. On 15th February it was estimated that the area of winter wheat sown in France this year is 12,500,000 acres, as against 13,606,000 acres last year. Seeding in Great Britain has been delayed, and the area of winter wheat sown is about 94 per cent. of that sown last year.

Reports from Russia indicate that there is a decrease in acreage sown to winter wheat, and that there will be a probable decrease in spring

sowings in 1916. No definite figures as to acreage sown are available, but as the normal area sown in Russia is 75,000,000 acres, any serious falling off in acreage would lead to a great diminution in yield.

Weather conditions in Italy have been unfavorable for extended sowings, and a diminished acreage is expected.

So far as the Southern Hemisphere is concerned, it is unlikely, unless wheat prices rise suddenly, and unless unusual stimulation is given by Governmental agencies, that the acreage sown in Australia will approach that of last year. It is too early yet to forecast the probable seeding in the Argentine, as seeding has just commenced.

Summing up the prospects for acreage, we may say that, so far as we can see at present, it is certain that there will be a considerable diminution in the acreage sown to wheat this year, and the final figures may utimately show a deficit of 15,000,000 acres as compared with last year. This, under normal conditions of yield, will give a diminished outturn of 240,000,000 bushels.

DIMINUTION IN AVERAGE YIELD.

Of equal effect in reducing the surplus would be the possible decrease in the average yield per acre in the wheat-growing countries of the world. The American crop of 1915 averaged 16.9 bushels per acre with, approximately, 60,000,000 acres sown to wheat. This was the highest average yield per acre secured by America for *30* years. The average yield for the 30 years prior to the war was 13.8 bushels per acre.

It is very unlikely that the weather conditions in America throughout the wheat-growing period would again be favorable for another bumper crop.

A survey of past records shows wide fluctuations in the average yield, varying from 12.5 bushels per acre in 1904 to 16.9 bushels per acre in 1915.

Already there are indications that there will be a considerable reduction in the average yield this year. Thus the official report for April by the Washington Agricultural Bureau states that the condition of winter wheat on 1st April was 78.3 per cent.—the worst on record. This indicates a probable yield of 14½ bushels per acre, equivalent to a total production of winter wheat of 495,000,000 bushels, as against *659,000,000* bushels of winter wheat last year—a reduction of *164,000,000* bushels.

It might be expected that the Canadian crop prospects would follow more or less closely those of America, since the principal wheat belts of each country experiences similar climatic conditions. In this case, there would be a considerable diminution in 1916.

On 10th March, the second official forecast of the Indian wheat crop was issued. The revised estimate shows that there is a shrinkage in acreage under crop of 1,807,000 acres, or nearly 6 per cent., compared with the previous year. It states that the failure of the winter rains in December and January seriously affected the crop, particularly in the un-irrigated areas in the Punjab, United Provinces, and the Bombay Presidency. The February rains, however, materially benefited the crop.

By the time this article is published, the crop estimate will probably have been issued, but present indications certainly point to a diminished output from India this season.

So far as Europe is concerned, it is difficult to secure exact information either as to acreage or the prospects of the 1916 crop. Judging by reports already received, it appears that the general condition of the winter-sown wheat is not as favorable as last year.

The cereal year of 1915 was the best on record in the history of the world, both in point of total acreage, total production, and total yield per acre.

A reduction of a bushel per acre in the average yield would mean a diminution in the aggregate production of 240,000,000 bushels. A reduction of 2 bushels per acre would more than wipe out last year's surplus.

In spite of the excessive cost of ocean freight, and the huge surpluses available for shipment, prices have remained at a satisfactory level in the exporting markets of the world, and are at present considerably in excess of pre-war prices. This may be seen in Table VI. of the appendix. Thus in Chicago the price of wheat in July, 1914, just prior to the war, was 3s. 4½d. per bushel. Since the war the lowest market price was 4s. 4½d. in November, 1915. It is now (15th April) 4s. 11d. per bushel.

If the war continues, the prices for wheat must remain at a profitable level in the exporting countries, otherwise there would be a diminished production, followed by an immediate and substantial rise in values.

The belligerents, who are now mobilizing all their available man power for military service, will find it increasingly difficult to keep up their full agricultural production, and must rely more and more on the exporting countries to feed their teeming millions. This more particularly applies to France, Italy, and Great Britain.

On the other hand, even if peace were declared, there is historical evidence to show that prices of wheat would remain at a high level for a considerable period, since belligerents invariably concentrate their energy and depleted capital to re-establishing their industries, repairing roads, railways, bridges, and factories, and developing their manufactures, rather than accelerating the volume of agricultural production.

In such a case, Germany and Austria, devastated Poland and Belgium, inured for nearly two years to restricted supplies of food-stuffs, would absorb a considerable portion of Russian surplus awaiting shipment at Black Sea ports.

Summing up the whole situation, we may say the prospects for a continuance of satisfactory prices is favorable.

The surplus of last year is threatened with extinction by the anticipated deficiency of this year.

Present indications point to a diminished outturn of wheat in 1916 owing to two causes—(*a*) shrinkage in acreage sown, and (*b*) decreased averages per acre due to unfavorable weather conditions.

The shrinkage in acreage in the Northern Hemisphere (where over 90 per cent. of the world's wheat is grown) will probably amount to 15,000,000 acres, involving a diminished outturn of 240,000,000 bushels.

The decreased return per acre, caused by unfavorable weather, will certainly amount to a bushel per acre, involving a diminished output of 240,000,000, *e.g.*, a total of at least 480,000,00 bushels.

III.—THE FARMERS' WORK FOR 1916.

The farmers of the State are advised to carefully watch the cables respecting the international wheat position during the next few weeks, with a view of confirming the extent of the diminished acreage in the Northern Hemisphere and diminished outturn per acre.

I have endeavoured to show that the statistical position hitherto markedly in favour of consumers of wheat, on account of the bumper crops and record surpluses, may be expected to gradually turn in favour of producers of wheat.

Even if pre-war prices only were expected, there is still the obligation on every farmer in the Empire to produce the maximum food-stuffs possible. Major-General Sir William Otter, in a message to the Canadian people, said, "Above all, measures should be taken to stimulate the production of food-stuffs. One of the greatest services which the Canadian people can render to the Empire is to increase our supply of food for the British people. This is at once our duty and our opportunity."

Australia's expenditure for the current financial year will amount to £73,000,000, more than half of which is loan money spent on defence. The loan expenditure must increase during the currency of the war, and with it the obligation of finding money to pay interest on the loan. In a country such as Australia, almost entirely dependent on primary production, the best way of meeting our constantly increasing obligations, and of maintaining a favorable trade balance, is to accelerate the volume of agricultural production and increase our exports of wool and wheat, butter, and meat. This can be done only by increasing the acreage under cultivation and in applying the utmost skill to secure the maximum return per acre.

Increased acreage on existing farms can now be secured by working all the team strength and all the man strength on the farm and the largest and most effective implements for the fullest available period every day. Mr. W. H. Hearst, Premier of Ontario, Canada, said in an address at Toronto, "The farmer at work in the field is doing as much in this crisis as the man who goes to the front."

Our farmers and farm hands should fully realize that by making sacrifices and working hard in the fields they are doing their bit towards ultimate Allied victory, which is to be won as much by producing an abundance of food-stuffs as by supplying freely men and munitions.

As regards the other factor—securing the maximum yield per acre—the essential factors for securing heavy wheat crops have been dealt with in considerable detail in past issues of this Journal, and were referred to in "Seeding Notes" issued in April, 1915.

Finally, we are experiencing difficulties by reason of our distance from the world's markets in providing freight for our products, and especially for our surplus wheat of 1915. It is probable that a considerable amount of wheat may be still unshipped by next harvest. Even so the financing of the crop should not prove an insuperable difficulty to a country with the resources of Australia. Our farmers have demonstrated that, when appealed to, they can produce an abundance of wheat. It should not be beyond the resources of the Commonwealth to find means for financing the crop.

APPENDIX.

A series of tables are given in this appendix covering information on—

1. The acreage sown to wheat in 1915 and 1914 in each of the principal wheat-growing countries of the world.
2. The production of wheat for 1914 and 1915, compared with the average production for the five years prior to the war, in the wheat-growing countries of the world.
3. Statistics of exports and imports of wheat for the five years prior to the war, and a statement of wheat available for export in the exporting countries compared with the requirements of the importing countries for season 1915-16.
4. The prices of wheat in importing and exporting countries for the decade prior to the war and the fluctuations in prices during the war.
5. The prices of freights for the five years prior to the war and the fluctuations that have taken place since.

The tables have heen compiled from official statistics issued by the International Institute of Agriculture, Rome.

Table I.

Showing the Acreage Under Wheat in 1914 and 1915, and the Percentage Increase in Area in 1915.

Country.		Area Sown, 1915.	Area Sown, 1914.	Percentage Increase in Area 1915 compared with 1914.
Victoria*		3,679,971	2,863,535	+ 28·5
Canada		13,138,000	10,414,000	+ 26·2
Australia †		11,984,971	9,651,081	+ 24·2
Great Britain		1,927,000	2,360,000	+ 22·5
Egypt		1,600,000	1,316,000	+ 21·6
India		32,607,000	28,797,000	+ 13·2
United States		60,113,000	54,167,000	+ 10·9
Argentina		16,612,000	15,650,000	+ 6·1
Italy		12,648,000	11,921,000	+ 6·1
Russia	Europe	65,370,000	62,631,000	+ 4·4
	Asia	14,702,000	14,415,000	+ 2·0
Spain		10,060,000	9,794,000	+ 2·7
Japan		1,189,000	1,187,000	+ 0·2
Algeria		3,246,000	3,407,000	— 4·7
France		14,279,000	15,150,000	— 6·1
Roumania		4,760,000	5,279,000	— 9.8

* Figures given in final estimate of Victorian Statist.
† Figures supplied by Commonwealth Statist.

This table summarizes the acreage sown to wheat in 1915—the first wheat season after the outbreak of war—as compared with the acreage under crop the season immediately prior to the war.

The Northern Hemisphere was busy gathering the 1914 crop when war was declared.

This table presents several interestiug features. It will be noted that, in spite of the stimulus of anticipated high prices of wheat and

the admitted necessity of producing as much wheat as possible. there was no material increase in acreage in the more important wheat-growing countries, except in British Possessions and the United States.

Victoria led the way with an increase of 28.5 per cent. over the 1914 acreage. Then followed Canada (26.2 per cent.), Australia (24.2 per cent.), Great Britain (22.5 per cent.), Egypt (21.6 per cent.), India (13.2 per cent.). and United States (10.9 per cent.).

Argentina (6.1 per cent.), Italy (6.1 per cent.), Russia (2 to 4 per cent.), Spain (2.7 per cent.) also showed slight increases; whilst France (—6.1 per cent.), Algeria (—4.7 per cent.). and Roumania (—9.8 per cent.) showed reductions in acreage.

TABLE II.

TOTAL WORLD PRODUCTION OF WHEAT, 1914-1915, COMPARED WITH AVERAGE PRODUCTION FOR FIVE YEARS PRIOR TO THE WAR.

Country.	Average Production for *five years*, 1910–14.	Production, *1914.*	Production, *1915.*	Percentage Increase in 1915 compared with *Average Yield* for five years, 1909–14.
				(1909-14 = 100%.)
	Millions of Bushels.			%
United States.. ..	727·2	888·8	1011·5	138
Russia	721·8	751·6	907·5	125
India	356·7	311·5	382·7	107
France	309·3	282·2	237·4	77
Canada	199·3	161·1	335·8	171
Italy	179·2	169·1	170·3	95
Hungary	182·0	105·0	151·1	84
Argentine	156·2	168·5	184·1	118
Spain	124·8	116·9	143·8	116
Roumania	85·2	46·4	89·5	105
Australia	**77·4**	**24·8**	**175·0**	**227**
Great Britain ..	59·5	62·4	74·1	127
Bulgaria	48·4	29·3	46·2	95
Algeria	34·8	34·8	34·5	99
Egypt	34·5	32·6	39·3	113
Japan	24·8	21·6	23·5	98
Holland	5·1	5·5	5·5	110
Denmark	5·8	5·8	8·1	139
Tunis	5·5	2·2	11·0	200
Germany	153·4	145·7*	124·8*	80
Austria	61·3	61·3*	47·7*	80
Belgium	14·6	13·9*	11·0*	75
Countries which do not contribute official statistics	377·6	371·4	367·0	
Grand Total ..	**3944·1**	**3816·8**	**4577·5**	**116**

* Estimated.

NOTES ON TABLE II.

This gives a summary of the production of wheat for each country of the world for the five years prior to the war, and also for each of the

years 1914 and 1915. A perusal of the table will show at a glance the remarkable increases in production in 1915 as compared with the five years prior to the war.

Australia easily led the way in percentage increase in production, for in 1915 she secured a total yield of 175 million bushels as compared with 77.4 million bushels for the five years prior to the war—nearly two and a half times the size of a normal crop. This was the record crop in her history. No other country, except Tunis, which had a relatively small area under crop, approached this increase in yield.

Canada had a remarkably good crop—her yield being 335 million bushels as compared with a normal production of 199 million bushels. Like Australia, she secured her record crop in 1915.

The greatest increase in actual volume was obtained by the United States and Russia. The American crop exceeded 1,000 million bushels—the record crop of any country and of any time. The increase was no less than 284 million bushels greater than her pre-war average. Russia, notwithstanding her active participation in the war, increased her production by 186 million bushels compared with pre-war production—a remarkable testimony of her wealth in human resources. As with America, Canada, and Australia, the 1915 crop was a record one for Russia.

Other countries showing substantial increases were Great Britain, Argentina, Egypt, Spain, and India.

On the other hand, there has been a shrinkage in yield in Japan, Bulgaria, Italy, Hungary, and France. The greatest shortage was observed in France, the production for 1915 being 72 million bushels less than the normal output in peace times. This was partly due to a falling off in area, but chiefly to a lesser yield per acre—one of the inevitable results of the mobilization of skilled farm workers of military age.

It is difficult to secure reliable information regarding wheat production in Germany and Austria. It is known that the harvest weather was very unfavorable, and that the yield was considerably less than the normal. In Hungary, the official estimate of production was 151 million bushels, a falling off of 31 million bushels compared with the normal yield. This represents a yield of 84 per cent. of the average.

It is estimated that the total yield of Germany and Austria is certainly less than Hungary, and would probably not exceed 80 per cent. of the normal yield, which would mean a deficiency compared with the pre-war period of 29 million bushels for Germany and 14½ million bushels for Austria.

Summing up, the total yield for the world for 1915 *is* 4,577 *million bushels as compared with* 3,816 *millions for* 1914, *and* 3,944 *millions for the pre-war period—an increase of* 761 *and* 633 *million bushels respectively. The previous world record harvest was obtained in* 1913, *when* 4,272 *million bushels were reaped.*

Tables III. and IV. show the probable demand and supply of wheat in the world for the year ending July, 1916. To find the probable demand, or the quantity requiring to be imported by the importing countries, we have to find out (1) the normal consumption in these countries, and (2) subtract from this their own production for 1915.

Table III.

Statement of Probable Demand and Supply of Wheat for Year Ending July, 1916.

DEMAND.

Importing Countries.

Country.	1. Production average for 5 years ending Feby., 1914.	2. Average net imports of wheat for 5 years prior to war.	3. Total average requirements prior to war.	4. Estimated production Season, 1915.	5. Requirement from abroad for year ending July, 1916.
		Millions of Bushels.			
Great Britain ..	59·4	216·0	275·4	74·1	201·3
France	317·0	43·6	360·8	237·4	123·4
Italy	186·9	53·2	240	170·3	69·8
Spain	130·2	6·2	136·4	143·8	— 7·3
Egypt	34·8	8·1	43·0	39·3	3·6
Japan	24·2	4·0	28·2	23·5	4·7
Holland	4·7	22·0	26·7	5·5	21·2
Denmark	4·7	6·2	11·0	8·1	2·9
Norway	·37	3·6	4·0	·3	3·6
Germany .. .	152·0	68·3	220·3	124·9*	95·5*
Austria	232·0	10·6	242·6	198·0*	44·6*
Belgium	14·7	49·2	63·8	11·0*	52·8*
Sweden	8·1	6·9	15·0	8·1	6·9
Switzerland ..	3·3	16·8	20·1	4·0	16·1
Tunis	5·9	·7	6·6	11·0	— 4·4
Countries which do not supply official statistics ..	377·6	110·1	110·1	367·0	120·7
Totals ..	1555·5	625·5	2181·0	1426·3	754·7

* Estimated.

Table IV.

SUPPLY.

Exporting Countries.

Country.	Average production for 5 years ending Feby., 1914.	Average net export of wheat and flour for 5 years prior to war.	Total average consumption.	Estimated crop for 1915.	Amount available for export (surplus).
		Millions of Bushels.			
Russia	817·3	164	653·3	907·5	254·2
United States ..	685	106·8	578·2	1011·5	433·5
India	350	49·5	300·5	382·7	82·7
Canada	197	94·6	102·4	335·8	233·4
Argentine	148·6	82·5	66·1	184·1	118·0
Roumania	87·8	53·6	34·2	89·5	55·4
Australia	90·7	53·2	37·4	175·0	137·6
Bulgaria	45·5	10·6	34·8	46·2	11·4
Algeria	34·8	5·5	29·4	34·5	5·1
Chili	19·4	1·8	17·6		
New Zealand ..	7·3	·7	6·6		
Totals of Exporting Countries ..	2484·6	623·0	1861·6	3151·2	1330·6

Similarly, to find the probable supply, or surplus available for export in exporting countries, we have to set out (1) the total production of these countries for the year 1915 and (2) deduct the estimated home requirements of the exporting countries.

In order to avoid fluctuations, it is best to estimate the normal requirements of each country on the basis of the five years' average prior to the war. These are summarized in Tables III. and IV.

In Table III. it will be seen that the importing countries of the world required annually, prior to the war, approximately 625 million bushels of wheat. For the year ending July, 1916, assuming a consumption equal to normal times, they would require 744 million bushels. But under war conditions it might be expected that these requirements would be modified.

Prior to the war the population of the importing countries was steadily increasing, and they were prosperous, consequently the requirements were increasing year by year. On the other hand, the high price of wheat in the importing countries during the war and the diminished income of the people would tend to economy in the consumption of wheat. The actual requirements for the year 1915, however, were almost equal to the average requirements for the five years prior to the war. Hence we may take the estimated requirements for 1916, in column 5, as approximately correct.

Of the 754 million bushels required for 1916, no less than 193 million bushels are required for Germany, Austria, and Belgium. Assuming the blockade is effective, this amount, less perhaps the quantity required to feed the needy Belgians, may be deducted from the total demand. This would leave from 561 to 614 million bushels as the probable effective demand in allied and neutral importing countries for the year ending July, 1916.

On the other hand, the exporting countries have available for shipment no less than 1,330 million bushels. Of this, the Russian and Roumanian surplus, amounting to 310 million bushels, is securely locked up in the Black Sea. So long as the Dardanelles are closed, this crop cannot be utilized to relieve the importing countries, and may be ignored in determining the present effective supply. Moreover, Bulgaria's surplus of 11½ million bushels must be deducted. This leaves, approximately, 1,010 million bushels surplus available for export in the United States, Canada, Argentina, India, and Australia. That is to say, excluding, on the one hand, the requirements of enemy countries, and, on the other hand, the available supplies of Russia and Roumania, we have a surplus equivalent to 1,010 million bushels competing for an effective demand of from 561 to 614 million bushels.

The statistical position is therefore eminently favorable for consumers of wheat, and equally unfavorable for wheat producers. In view of the heavy surpluses available for export, one would have expected a serious fall in wheat values since last harvest, especially in the exporting markets.

Table VI. gives a summary of the monthly quotation for wheat in London, Genoa, Winnipeg, Chicago, and Buenos Ayres for the year 1915. The prices are taken approximately at the middle of the month. It will be seen that there was a considerable decline in value in June, 1915, when the prospects for a big harvest were assured, but that prices have been well maintained since. In spite of scarcity of freight and the immense surplus, the level of prices in the exporting countries is considerably higher than it was at the outbreak of war. It must be

remembered that the prices of wheat in Chicago and Winnipeg are below the f.o.b. American prices. Chicago is over 1,000 miles inland from New York, and Winnipeg about 1,750 miles from Montreal.

The prices at the Chicago and Winnipeg markets correspond approximately to the prices the farmers of the United States and Canada obtain for their wheat.

Table V.

Average Prices of Wheat per Bushel for Calendar Year in Importing and Exporting Countries for the Ten Years prior to the War

—	Importing Countries.				Exporting Countries.			
	United Kingdom.	France (Paris).	Italy.	Germany (Berlin).	Russia (Odessa), Red Winter.	United States.	Canada, No. 1 Northern.	Australia (Melbourne).
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
1905 ..	3 11	5 1½	5 8¼	4 8½	3 7¼	4 2½	3 9	3 5¼
1906 ..	3 9¾	5 1¾	5 5¾	4 10¼	3 4½	3 3½	3 2	3 3¼
1907 ..	4 2	6 6¾	5 8	5 6¾	4 1	3 9½	3 8	3 9½
1908 ..	4 6½	4 11¼	6 4¾	5 8¾	4 8¾	4 1	4 3¾	4 2½
1909 ..	5 0¼	5 3¾	6 8¾	6 3¾	4 8¼	4 11¾	4 6¼	4 7¾
1910 ..	4 6½	5 8¾	6 2¾	5 8½	3 11¼	4 6¾	3 11¼	3 10¾
1911 ..	4 3¾	5 8¼	6 0¾	5 6	3 10½	4 0¾	3 11½	3 6¾
1912 ..	4 7¼	6 3¾	6 9¾	5 10¼	4 3¼	4 4½	4 1	4 1½
1913 ..	4 5¾	6 0¾	6 1½	5 4½	4 0	3 11½	3 8	3 8¼
1914 ..	5 0	..	6 4	..	..	4 3¾	4 1¾	..
Average of 10 years per bushel	4 5	5 6¼	6 2	5 6¼	4 1	4 2	3 11¼	3 10

These figures, abstracted from the *Statistical Annual*, Rome, give the average prices of wheat in four typical importing countries and four typical exporting countries for the decade prior to the war.

These figures are not strictly comparable, because they refer, of course, to somewhat different qualities of wheat. The Melbourne prices for Australian wheat, for example, are slightly above the London parity of the bulk of imported wheat. They are, however, representative of the bulk of the wheat sold at the ports referred to.

It will be seen that the average price of imported wheat in Great Britain for the ten years prior to the war was 4s. 5d. per bushel, and the price in Paris, Rome, and Berlin was, approximately this price plus the import duty (Germany, 1s. 6d. per bushel; France, 1s. 6¼d. per bushel; and Italy, 1s. 7¾d. per bushel).

That is to say, the exporting countries might expect to get for wheat shipped to Europe about 4s. 5d. per bushel at the port of delivery, and that the price of wheat in Europe was this price plus an addition equal to the import duty.

The prices in the exporting countries were, as might have been expected, roughly, equal to this price less the cost of ocean carriage, and that the price would vary with the distance of the exporting port from the world's markets. A feature of interest is the way in which prices are levelled in normal times in different countries by the low cost of freight.

TABLE VI.

TABLE SHOWING FLUCTUATIONS IN PRICE OF WHEAT DURING THE WAR.

—	Importing Countries. London.	Importing Countries. Genoa.	Exporting Countries. Winnipeg.	Exporting Countries. Chicago.	Exporting Countries. Buenos Ayres.
	per bushel. s. d.	per bushel. s. d.	per bushel. s. d.	per bushel. s. d.	per bushel. s. d.
1914.					
July	4 5¼	5 8¼	3 7½	3 4½	4 1½
1915.					
January ..	6 11½	8 9½	5 8	5 11½	5 2¼
February ..	7 9¾	9 0¼	6 2¼	6 6	5 8
March	8 2¼	9 9¼	6 1	6 7½	5 9½
April	8 3½	9 8	6 0¾	6 5¼	5 11¼
May	8 6¼	9 8	6 7¾	6 5½	6 1¾
June	6 11½	8 2¼	4 11½	5 0½	5 5¼
July	6 8½	7 11½	5 7½	5 8½	5 6¾
August ..	7 1¾	8 10	5 2¼	4 10¾	5 5¾
September ..	7 1¾	8 5½	3 11¼	4 6¾	5 4½
October ..	7 4¾	9 1¼	4 2¼	4 9¾	5 6½
November ..	7 4¼	9 1¼	4 1¼	4 4½	5 2½
December ..	7 5	9 6	4 1¼	4 6½	..
1916.					
April 15th ..	8 1	..	..	4 11	..

According to the system used by the institute, the prices are the actual prices in each country calculated at the par rate of exchange. This is accurate enough in ordinary times, but the rates of exchange have fluctuated considerably during the currency of the war, and it is necessary to take this into account when comparing prices of one country with another. The rate of exchange on London on 11th December, 1915, was as follows:—Paris, − 9 per cent.; Italy, − 19 per cent.; New York, + 3 per cent.

TABLE VII.

FLUCTUATIONS IN OCEAN FREIGHTS TO LIVERPOOL PRIOR TO THE WAR.

(Per bushel.)

—	United States (New York).	Russia (Odessa).	Argentina (Bahia Blanca).	India (Bombay).	Australia (Melbourne) Sailer.	United States (North Pacific).
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1909	0 1¾	0 2½	0 2½	0 4¼	0 7	0 7½
1910	0 1½	0 2¾	0 3¼	0 4½	0 7	0 7½
1911	0 2¾	0 3	0 3¼	0 5	0 8	0 7½
1912	0 3¾	0 4	0 7	0 6¾	0 9¾	0 10
1913	0 2¾	0 3	0 6¼	0 5½	0 10	1 0¼
Average 5 years (per bushel) ..	0 2¾	0 3	0 4⅝	0 5¼	0 8⅜	0 9⅛
Shillings per ton ..	7 6	9 3	14 3	16 6	26 2	28 2

Prior to the war the average price of freight from the principal exporting countries was as follows:—

New York	7s. 6d.	per ton
	2¾d.	per bushel
Odessa	9s. 3d.	per ton
	3d.	per bushel
Argentina	14s. 3d.	per ton
	4⅝d.	per bushel
India	10s. 6d.	per ton
	5¼d.	per bushel
Australia (Sailer)	20s. 2d.	per ton
	8⅜d.	per bushel
Pacific Coast	28s. 2d.	per ton
	9⅛d.	per bushel

TABLE VIII.

FLUCTUATIONS IN PRICES OF FREIGHTS DURING WAR PERIOD.

—	New York.		Bombay.		Argentine.		Australia (Sailer).	
	Shillings per ton.	Price per bushel.	Shillings per ton.	Price per bushel.	Shillings per ton.	Price per bushel.	Shillings per ton.	Price per bushel.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Average of 5 years ending 1913	7 6	0 2⅜	16 7	0 5⅜	13 0	0 4¼	26 2	0 8⅜
1914.								
July ..	8 0	0 2⅛	12 0	0 4	10 6	0 3½	..	..
1915.								
January ..	31 4	0 10⅛	32 6	0 10½	62 6	1 8	No Export	
August ..	31 3	0 10	46 0	1 2¾	62 6	1 8	"	"
September ..	40 8	1 1¼	42 6	1 1¾	60 0	1 7¼	"	"
October ..	62 5	1 8	42 6	1 1¼	65 0	1 9	62 6	1 8
November ..	62 5	1 8	60 0	1 7¼	85 0	2 3¼	70 0	1 10½
December ..	59 4	1 7	70 0	1 10½	112 6	3 0	75 0	2 0
1916.								
January ..	62 5	1 8	105 0	2 9¾	140 0	3 9	75 0	2 0

The above table summarizes the price of freights to Liverpool from New York, Bombay, Argentine, Australia, for certain periods during the war.

It will be noticed that compared with rates for preceding five years freight was cheaper at the outbreak of war than it had been for many years past. The cost of freight has risen enormously during the war period, especially in the Argentine, where freights for January, 1916, were 140s. per ton, or 3s. 9d. per bushel, as compared with 10s. 6d. per ton, or 3½d. per bushel, immediately before the war.

The Australian freights were chartered by the Commonwealth Government, but there was very limited freights at the figure officially announced for sailers (75s. per ton). Steamer freights from Australia on January were 105s. per ton (2s. 9d. per bushel), and have risen to

the neighbourhood of 140s. per ton (3s. 9d. per bushel), and are difficult to secure even at that price.

Taking the freights as they are in the table, it will be seen that in eighteen months they have risen from ten to fifteen times their normal value. This remarkable rise is chiefly due to the heavy requisitioning of the allied mercantile marine for the transport of men, foodstuffs, and munitions for the allied Governments.

SUMMARY.

1. The Victorian wheat-growers, in response to the appeal for increased sowings of wheat last year established two world records.

2. The increase in area was 28½ per cent. greater than the previous year—itself a record—and 63 per cent. greater than the average of five years prior to the war.

3. No other wheat-growing country of equal output gave such an increase in acreage.

4. The yield was 58½ million bushels, compared with an average yield of 23½ million bushels for the 5 previous years—an increase of 150 per cent. This increase, as compared with the normal output, also constitutes a world's record.

5. The present f.o.b. price is the best export price secured for 40 years, and if the whole harvest could be sold at current rates it would represent in money value three normal crops.

6. The prospects for a big acreage for 1916, however, are not bright, as the area in preparation for wheat is apparently much less than normal years.

7. Scarcity of farm labour, and lack of substantial autumn rains in the wheat areas are partly responsible for the probable reduction in acreage.

8. An important factor, however, is the general uncertainty among farmers as to probable prices for wheat for next year.

9. The foregoing paper attempts to show that, though the present statistical position is favorable for wheat consumers, there is reason to believe that by next harvest it will gradually turn in favour of the producer.

10. The world reaped its record crop—4,577 million bushels—in 1915.

11. The exporting countries have a surplus for export of 1,320 million bushels for the year ending July, 1916.

12. Of this 310 million bushels are locked up in Russia and Roumania, leaving 1,010 million bushels awaiting export in America, Canada, Argentina, India, and Australia.

13. The importing countries (excluding enemy countries) require 561 million bushels, hence there is a surplus above requirements of 449 million bushels.

14. There are two factors in the present world outlook for wheat that growers are advised to carefully watch—(*a*) diminution in acreage in other countries, (*b*) reduction in average yield per acre as compared with last year.

15. The shrinkage in world acreage for the current year would probably exceed 15 million acres, involving a lessened production of 240 million bushels.

16. In view of the unfavorable weather reports in Europe, India and America, the average yield per acre for the coming crop would in all probability be much less than last year

A shrinkage of one bushel per acre would mean a diminution of 240 million bushels. The diminution in the winter wheat yield in the United States this year is estimated to be 164 million bushels.

17. Thus the statistical position may be expected to turn gradually in favour of producers of wheat.

18. If the war continues for some time the demand for wheat must increase, and prices must remain at a profitable level in the exporting wheat countries.

19. If peace is declared, historical evidence shows there is a probability of high prices for some years after the termination of the war.

20. To maintain a favorable trade balance and provide interest on our ever increasing loan obligations, Australia must accelerate her agricultural production and increase her exports of wool and wheat, butter and meat.

21. Our farmers have demonstrated that when appealed to they can produce wheat.

It should not be beyond the resources of the Commonwealth to find the means for financing the crop.

SPINACH AS A MEDICINAL VEGETABLE.

All varieties of spinach are good food products. It has recently become known that spinach contains two kinds of saponine, a substance which is regarded as having a clearing action on the lungs and respiratory passages, a fact which may become of considerable interest to persons suffering from lung troubles.

By spinach is meant the ordinary garden vegetable, which the botanists call *Spinacia oleracea*.

In preparing spinach fresh from the garden for table use, it should be freed from the seed pods as much as possible, and washed under flowing water in a colander. It may be finely chopped, placed in a pot without any water, put on the fire and cooked. This is possible because nine-tenths of the weight of the substance is water. By proceeding in this way one will obtain a very well-flavoured and very satisfactory vegetable from which nothing whatever is lost.

The method generally used of scalding the spinach, and then throwing away the blanching water has been objected to by dietitians and food chemists for twenty years.

Repeated chemical analyses prove that 20 per cent. of the fat, 5 per cent. starch, 26 per cent. sugar, 32 per cent. lime, 74 per cent. magnesia, and 63 per cent. of the phosphoric acid is lost in the blanching process.

Jürgensen says the throwing away of the blanching water is as nonsensical as would be the throwing away of beef broth.

Among the varieties mentioned are Giant Catillon, Long Leaf Winter, Yellow Swiss, Gandry, Goliath, Flemish, Ideal, Viroflay, Giant Shimose. Triumph, and Victoria.—[Extracts from article in *Pure Products*, November, 1914.]

PICKLING WHEAT.

By H. A. Mullett, B.Ag.Sc., Science Cadet.

That Ball-Smut or Bunt can be prevented in the wheat crop by the intelligent use of a proper pickle is so well known that a repetition of the fact sounds trite; yet in every farming community there are always some men who are docked from 1d. to 3d. a bushel for smutty wheat, and a great many more experience certain misgivings when they notice the wheat buyer carefully poking his sampler just up along the inside of the bag.

Besides this near-sighted view of direct loss to the individual grower, there is a much broader question, and it concerns the national efficiency. As a wheat exporting country, our wheat comes into competition with that from all parts of the globe, and although Australian wheat has stamped itself as second to none for flour production, yet we have great handicaps, such as distance from the markets and the vagueness of the seasons, that make it criminal to neglect any preventable cause of loss, however small it may seem to the individual.

Every farmer makes it his business to reserve his seed from the cleanest and best of his crop, and the systematic pickling of this apparently clean seed is routine practice, so that the cause of failures and partial failures can only be ascribed to a lack of proper understanding of the scientific facts, and to the use of obsolete methods.

The standard pickles, viz., 1½ per cent. bluestone (1½ lbs. in 10 gallons of water) and 1 lb. formalin in 45 gallons water, with immersion for five minutes, have proved very successful when used for normal seeding conditions, but farmers, for economic reasons, are often forced to depart from regular methods, and it is here especially that a working knowledge of the principles involved becomes essential.

PRINCIPLES INVOLVED.

Briefly, to enumerate, first, the characteristics of the disease; and, secondly, those concerning the action of the pickle, they are:—

(1) That ball-smut or bunt is a fungus disease, propagated by means of tiny seeds or spores, and that almost the only means of infection of a wheat crop is by the sowing of untreated spores in *actual contact with grain*. Each ball of smut contains enough of these spores to infect every grain in a bushel of wheat four or five times over, and when it is considered that these balls when unbroken are impervious to the pickle, it will be seen that any treatment of the smutty seed may be risky business if these are not eliminated.

(2) Bluestone and formalin act mainly as contact poisons, and the brush of the wheat grain where the spores readily collect are particularly difficult to wet. The effect of the pickle is not limited to the spores alone, but it also

depresses the germination of the grain, and subsequent growth for a time is lower than normal. This effect on the germination increases with the strength of the pickle, so that care must be taken to make up pickling solutions in a definite manner, or germination may be unduly interfered with, while on the other hand too weak a solution will not kill the spores.

The standard pickles mentioned above will be found satisfactory in these respects, but if for any reason an increased strength is necessary, it should be automatically followed by a heavier rate of seeding; while for late sowing, where a quick germination is required, or where weeds are bad, the strength may be reduced with advantage to rapid growth.

Bluestone or Formalin.

There has been considerable controversy as to whether formalin or bluestone is the better. Formalin pickling is generally recognised as easy and quick to work with, and its use is very general where apparently clean seed is to be sown within a week or two after pickling; but if grain so pickled is allowed to stand for longer than that time, or sown under "dry" conditions, the seed coat becomes tough and germination may be faulty.

With bluestone there is no such toughening, there is less danger of re-infection, and it is generally found to depress germination less; hence *bluestone is especially useful for sowing smutty seed, or when sowing* "dry," pickling early, or when sowing late.

Making up the Pickle.

The making up of the pickling solution is very important, and no pains should be spared to accomplish it in a definite manner. The several brands of formalin now obtainable are of 37-38 per cent. strength, and can be used with confidence. The standard pickle strength required, viz.: 1 in 450, means 1 lb. of formalin added to 450 lbs. of water; the weight of formalin to be mixed must therefore be known, and the water can be conveniently measured with a kerosene tin, remembering that one gallon of water weighs 10 lbs.. Formalin is often put up in bottles holding 1 lb. exactly, and to make 45 gallons of pickle one has then simply to pour the contents of the bottle into 45 gallons of water and stir the mixture with a stick.

To produce the bluestone pickle requires more time and labour, owing to the relative difficulty of dissolving bluestone. The 1½ per cent. standard solution means 1½ lbs. bluestone, by weight, dissolved in 10 gallons of water; and the quickest way to dissolve it is to suspend the weighed quantity in a piece of hessian *just under the surface of the water.* When using bluestone, the solution must be held in wooden or copper vessels; if kept for any length of time bluestone solution will concentrate, owing to evaporation, but formalin solution will gradually become weaker.

Pickling by Immersion.

Fig. 1.—Wheeling untreated wheat on to the lifter.

Fig. 2.—Raising the wheat.

Fig. 3.—Wheat trickling into solution where it can be stirred and skimmed.

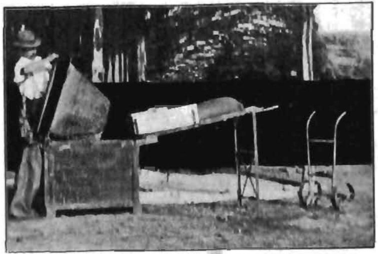


Fig. 4.—Emptying treated grain into sack.

PICKLING METHODS.

Any pickling method to be successful must fulfil three conditions:—

(1) Satisfy the principles enumerated above;
(2) Be not easily susceptible of abuse:
(3) It must be economical of time and labour.

There are three well known methods that more or less satisfy these conditions. They are:—

(1) *The barn-floor method.*—The grain from three or four bags is tipped on to a good floor, or into a large trough, and pickle made up as directed, is added to the grain from time to time as required, the grain being turned with a shovel until the mass is thoroughly and evenly moistened. In the hands of an expert, this is a very quick and satisfactory method, but for general use, since the end point depends on the energy and conception of the operator, it does not fulfil the second condition laid down, and for smutty seed it provides no method of getting rid of the smut-balls. Again, one may forget to dip the bag, and so possibly re-infect the seed.

(2) *The bag immersion method.*—Wheat is generally broken down into butts (afterwards convenient for use on the drill), and each of these is lowered into the standard pickle contained in a cask, and left there from four to five minutes. It is usual to vigorously lift the butt up and down in the pickle to cause even wetting of the grain, but the time of immersion will usually insure this. This way is undoubtedly slower than the barn-floor method, but it has the inestimable value of being independent of the skill of the operator, who, merely observing the rules, could pickle on a hundred occasions and still be sure that the treatment would be the same. That is to say, this method is based on a time standard, and it will be noted that the bag must necessarily also be disinfected.

(3) *Immersion in an open perforated vessel.*—Most farmers are satisfied with one or other of the above methods, or some modification of them, but all of which entail considerable labour without being ideal. Of late years, several good picklers embodying the above principle have been put on the market. They are of reasonable price, and are efficient in time, labour, and in operation. One style of machine consists of four essential parts as follows:—

(1) The bag-lifter;
(2) The perforated hopper;
(3) Watertight wooden vessel containing hopper and pickle;
(4) The bag holder.

The machine is so arranged that a bag of wheat may be wheeled to the bag lifter, the mouth opened, and lifter and all tilted until the grain begins to pour into the pickle held in the perforated copper

vessel, which in turn fits into the wooden hopper. By agitation any straw, cocky-chaff, backbones, or smut-balls rise to the surface and may be skimmed off. After four to five minutes' immersion the perforated hopper, which works on a swivel at one end, is pushed up clear of the pickle, drained rapidly, and the contents emptied into a bag attached to the bag holder. With this pickler seven to eight bags an hour can be pickled by one man. (*See* Figs 1, 2, 3, 4.)

There is another machine, in which the perforated vessel is attached by a pulley to a steel upright over the barrel. The perforated vessel can be raised or lowered, and it is on a swivel, so that it can be swung out from the barrel, filled, immersed, and swung out this time over a bag holder; the grain being restored to the bag after draining by releasing a false bottom in the perforated vessel.

To any farmer who is not satisfied with the results obtained with his present method, or who spends most of his evenings at seed time bending over a cask, or wielding a shovel, a modern pickling machine is worthy of his earnest consideration.

Machines of the perforated vessel type are in operation at the several seed stations of this Department, and have proved satisfactory in every respect.

POISONING CROWS.

By H. C. Churches, Dairy Supervisor.

Among the many pests that the man on the land has to contend with, the ubiquitous black crow may be placed well in the van for doing its share of destruction. Its cowardly attack on young lambs is well known to every sheep-owner. Small young pigs are also liable to attack, and as a cunning and daring egg thief the crow can take first place. That this pest, however, can be poisoned in fairly large numbers—especially during lambing season—has been proved by Mr. J. F. Jager, a local grazier at Swan Hill. The method adopted by him is to use, for preference, the freshly skinned carcass of sheep or lamb, flay it well, and smear evenly all over with S.A.P. rabbit poison, partly remove the entrails, smear them also, and replace. The fleshy side of the skin may be smeared in the same manner, and hung over a log or stump near at hand. If the carcass is treated while the animal heat is still in it, so much the better. This method of poisoning crows is superior to "baiting" with strychnine, or the practice of mixing strychnine and fat, the birds being generally able to disgorge the strychnine bait before it has time to have a fatal effect.

A tin or two of S.A.P. kept in secret places in the paddocks can be used on the carcass of any dead or dying sheep that may from time to time be found on the usual visit round the run.

GOVERNMENT CERTIFICATION OF STALLIONS.*

STALLION PARADES.

TIME TABLE, 1916.

(Subject to alteration on short notice.)

District and Date	Place.	Time.	Officer Arrives.	Officer Departs.
SPECIALS.				
Every Saturday:— June 24 to Dec. 23 ..	Agricultural Offices	10 a.m. to 12 noon		
July 17 to July 19 ..	City Horse Bazaar	10 a.m.		
July 24 to July 26 ..	Royal Show Grounds			
WIMMERA No. 1.				
Monday, July 3 ..	Ararat ..	2 p.m. ..	1.27 p.m. ..	7.50 p.m.
Tuesday, July 4 ..	Goroke ..	3.30 p.m. ..	3.15 p.m. ..	7 p.m.
Wednesday, July 5 } Thursday, July 6 }	Horsham ..	10 a.m. ..	10.20 p.m. (4th)	4.40 p.m. (6th)
Friday, July 7 ..	Stawell ..	12 noon ..	7.46 p.m. (6th) ..	2.40 p.m.
MALLEE No. 1.				
Monday, July 10 ..				
Tuesday, July 11 ..	Mildura ..	2 p.m. ..	7 a.m. ..	6 p.m.
Wednesday, July 12 ..	Ouyen ..	2 p.m. ..	9.45 p.m. (11th)	9.45 p.m.
Thursday, July 13 ..	Sea Lake ..	3 p.m. ..	Driving ..	8.30 a.m. (14th)
Friday, July 14 ..	Wycheproof	11.50 a.m.	11.50 a.m. ..	12.40 p.m.
WESTERN No. 1.				
Tuesday, August 1 ..	Coleraine ..	11 a.m. ..	7.35 p.m. (July 31)	Driving
Tuesday, August 1 ..	Casterton ..	3 p.m. ..	Driving ..	8.30 a.m. (2nd)
Wednesday, August 2	Hamilton ..	3 p.m. ..	12 noon ..	6.10 a.m. (3rd)
Thursday, August 3 ..	Warrnambool	12 noon ..	9.52 a.m. ..	3.15 p.m.
Friday, August 4 ..	Camperdown	10 a.m. ..	5.10 p.m. (3rd) ..	Driving
Friday, August 4 ..	Colac ..	2 p.m. ..	Driving ..	3.35 p.m.
WIMMERA No. 1.				
Monday, August 7 ..				
Tuesday, August 8 ..	Rainbow ..	2 p.m. ..	11.55 a.m. ..	8.10 p.m.
Wednesday, August 9	Minyip ..	3 p.m. ..	Driving	6.22 p.m.
Thursday, August 10	Hopetoun ..	10 a.m. ..	10.40 p.m. (9th)	10.50 a.m.
Thursday, August 10	Warracknabeal	3 p.m. ..	1.35 p.m. ..	10.30 a.m. (11th)
Thursday, August 10	Geelong	3 p.m. ..	12.50 p.m. ..	6 p.m.
Friday, August 11 ..	Murtoa ..	2 p.m. ..	12.30 p.m. ..	5.50 p.m.

* Owing to pressure on space the Ninth Annual Report (Season 1915) by Mr. W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer, on the Veterinary Examination of Stallions, has been omitted and will appear in next issue.

STALLION PARADES, TIME TABLE—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
WIMMERA No. 2.				
Monday, August 14 ..				
Tuesday, August 15 ..	Kaniva ..	2 p.m. ..	2.28 a.m. ..	12.42 a.m. (16th)
Wednesday, August 16	Nhill ..	2 p.m. ..	1.24 a.m. ..	8.14 a.m. (17th)
Thursday, August 17	Dimboola ..	2 p.m. ..	10.19 a.m. ..	11 a.m. (18th)
Friday, August 18 ..	*Jeparit* ..	*2 p.m.* ..	*12.23 p.m.* ..	9.23 p.m.
MALLEE No. 2 AND CENTRAL No. 1.				
Tuesday, August 22 ..	Birchip ..	2 p.m. ..	8.20 p.m. (21st)	3.15 p.m.
Tuesday, August 22 ..	Donald ..	5.15 p.m. ..	5.15 p.m. ..	5.50 a.m. (23rd)
Wednesday, August 23	St. Arnaud ..	10 a.m. ..	7.11 a.m. ..	2.10 p.m.
Wednesday, August 23	Maryborough	5 p.m. ..	5 p.m. ..	6.30 p.m.
Thursday, August 24	Smeaton ..	11 a.m. ..	Driving ..	Driving
Thursday, August 24	Daylesford ..	2 p.m. ..	Driving ..	3.25 p.m.
Friday, August 25 ..	Rochester ..	11 a.m. ..	9.49 p.m. (23rd)	1.36 p.m.
Friday, August 25 ..	Echuca ..	*2.15 p.m.*	2.15 p.m. ..	3.45 p.m.
Friday, August 25 ..	Elmore ..	5 p.m. ..	4.55 p.m. ..	9.25 a.m. (26th)
MALLEE No. 3.				
Monday, August 28 ..	Pyramid ..	3 p.m. ..	2.17 p.m. ..	9.4 p.m.
Tuesday, August 29 ..	Kerang ..	12 noon ..	10.16 p.m. (28th)	3.13 p.m.
Wednesday, August 30	Swan Hill ..	9 a.m. ..	6.25 p.m. (29th)	10.50 p.m.
Wednesday, August 30	Quambatook	3 p.m. ..	Driving ..	Driving
Thursday, August 31	Bendigo ..	11 a.m. ..	10.45 a.m. ..	12.15 p.m.
Friday, Sept. 1 ..	Charlton ..	11 a.m. ..	4.7 p.m. (31st August)	1.45 p.m.
NORTH-EASTERN No. 1.				
Monday, Sept. 4 ..	Rutherglen	2 p.m. ..	1.48 p.m. ..	3.22 p.m.
Tuesday, Sept. 5 ..	Yarrawonga	10 a.m. ..	10.5 p.m. (4th)	Driving
Tuesday, Sept. 5 ..	Tungamah	3.30 p.m.	Driving ..	8.6 a.m.
Wednesday, Sept. 6 ..	Benalla ..	10 a.m. ..	10 a.m. ..	11.25 a.m.
Wednesday, Sept. 6 ..	Wangaratta	2 p.m. ..	12.7 p.m. ..	4.37 p.m.
Thursday, Sept. 7 ..	Euroa ..	10 a.m. ..	6.33 p.m. (6th)	11.11 a.m.
Thursday, Sept. 7 ..	Seymour ..	2 p.m. ..	12.5 p.m. ..	6.15 p.m.
Friday, Sept. 8 ..	Murchison ..	9.30 a.m.	7.30 p.m. (7th)	10.58 a.m.
Friday, Sept. 8 ..	Rushworth	2 p.m. ..	11.48 a.m. ..	4.56 p.m.

STALLION PARADES, TIME TABLE—*continued*.

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
GOULBURN VALLEY No. 1.				
Monday, Sept. 11 ..	Numurkah ..	1 p.m. ..	12.18 p.m. ..	Driving
Monday, Sept. 11 ..	Cobram ..	2.30 p.m.	Driving ..	Driving
Monday, Sept. 11 ..	Nathalia ..	4.30 p.m.	Driving ..	Driving
Tuesday, Sept. 12 ..	Dookie ..	10 a.m. ..	Driving ..	Driving
Tuesday, Sept. 12 ..	Shepparton ..	1 p.m. ..	Driving ..	Driving
Tuesday, Sept. 12 ..	Kyabram ..	3 p.m. ..	Driving ..	Driving
Tuesday, Sept. 12 ..	Tatura ..	4 p.m. ..	Driving ..	Driving
Wednesday, Sept. 13 ..	Mansfield ..	2 p.m. ..	1.50 p.m. ..	3.30 p.m.
Thursday, Sept. 14 ..	Alexandra ..	2 p.m. ..	12.25 p.m. ..	4.40 p.m.
Friday, Sept. 15 .	Kilmore ..	9.30 a.m. .	9.50 p.m. (14th)	10.37 a.m.
Saturday, Sept. 16 ..	Werribee ..	12 noon .	11.47 a.m. ..	1.36 p.m.
CENTRAL No. 2.				
Monday, Sept. 18 ..	Mernda ..	2 p.m. ..	12.50 p.m. ..	8 p.m.
Tuesday, Sept. 19 ..	Kyneton ..	3.30 p.m ..	3.12 p.m. ..	5.5 p.m.
Wednesday, Sept. 20	Romsey ..	2 p.m. ..	10.21 a.m. ..	5.25 p.m.
Thursday, Sept. 21 ..	Bacchus Marsh	12 noon ..	9.11 a.m. ..	5.40 p.m.
Friday, Sept. 22 ..	Ballan ..	9 a.m. ..	6.33 p.m. (21st)	10.5 a.m.
Friday, Sept. 22 ..	Ballarat ..	12 noon ..	11.8 a.m. ..	3.5 p.m.
SPECIAL.				
Monday, Sept. 25 ..	Royal Show	9 a.m. ..		
GIPPSLAND No. 1.				
Monday, October 2 ..	Warragul ..	2 p.m. ..	10.30 a.m. ..	7.36 p.m.
Tuesday, October 3 ..	Trafalgar ..	10 a.m. ..	8.8 p.m. (2nd) .	11.16 a.m.
Tuesday, October 3 ..	Sale ..	2 p.m. ..	1.26 p.m. ..	4.33 p.m.
Wednesday, October 4	Traralgon ..	11 a.m. ..	5.42 p.m. (3rd) ..	12.20 p.m.
Wednesday, October 4	Bairnsdale ..	3.30 p.m.	3.25 p.m. ..	5.40 a.m. (5th)
Thursday, October 5	Dandenong	3 p.m. ..	12.37 p.m. ..	6 p.m.
Friday, October 6 ..	Lang Lang ..	9 a.m. ..	7.14 p.m. (5th) ..	9.50 a.m.
Friday, October 6 ..	Korumburra	3 p.m. ..	10.32 a.m. ..	5 p.m.
GIPPSLAND No. 2.				
Monday, October 9 ..	Lilydale ..	3 p.m. ..	2.47 p.m. ..	5.35 p.m.
Tuesday, October 10	Dalyston ..	2 p.m. ..	10.34 a.m. ..	4.20 p.m.
Wednesday, Oct. 11 ..	Leongatha ..	10 a.m. ..	9.2 p.m. (10th) ..	11.16 a.m.
Wednesday, Oct. 11 ..	Foster ..	2 p.m. ..	12.40 p.m. ..	8.44 p.m.
Thursday, October 12	Yarram ..	11 a.m. ..	10 p.m. (11th) ..	12.5 p.m.
Friday, October 13 ..				
NORTH-EASTERN No. 2.				
Tuesday, October 17 ..	Tallangatta	4.30 p.m.	4.30 p.m. ..	5 a.m. (18th)
Wednesday, Oct. 18 ..	Corryong ..	3.30 p.m.	3.30 p.m. ..	7 a.m. (19th)
Tuesday, October 17 ..	Orbost ..	3 p.m. ..	2.45 p.m. ..	8 a.m. (18th)
Wednesday, Oct. 25 ..	Omeo ..	3 p.m. ..	6.30 p.m. (24th)	6.30 a.m. (26th)

SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
			DRAUGHTS.			
2905	Abbey Dale ..	6 years	Mitchell and O'Brien	Agricultural Offices Special	18.3.16	W.M.L.
2805	Abbot's Pride ..	6 years	Hon. S. Winter-Cooke	Hamilton ..	14.7.15	R.G.
2813	Admiral Howard ..	6 years	R. N. Herkes ..	Newmarket ..	27.7.15	R.N.J.
2845	Aird Laddie ..	6 years	C. and E. C. Yeaman	Rochester ..	17.8.15	W.J.C.
2840	Albert Onward ..	5 years	T. Coldwell ..	Shepparton ..	12.8.15	R.N.J.
2819	Argyle	5 years	F. McRae ..	Warracknabeal ..	6.8.15	R.G.
2841	Barnay	5 years	G. and L. Smith ..	Shepparton ..	12.8.15	R.N.J.
2804	Baron	5 years	N. McDonald ..	Casterton ..	13.7.15	R.G.
2893	Baron's Heir ..	6 years	O. Maroske ..	New Zealand Exam.	6.9.15	..
2889	Baron's Heir ..	5 years	G. Fraser ..	Ballarat ..	10.9.15	R.G.
2856	Baron's Own ..	5 years	S. Nixon ..	Euroa	20.8.15	W.J.C.
2827	Blossom's Pride ..	5 years	T. McMillan ..	Mildura ..	4.8.15	W.M.L.
2896	Bonny Prince ..	5 years	D. Murphy ..	Echuca Special Exam.	6.10.15	W.M.L.
2829	Convincer ..	5 years	Dyke Bros. ..	St. Arnaud ..	6.8.15	W.M.L.
2820	Dominition ..	5 years	A. Arnold ..	Warracknabeal ..	6.8.15	R.G.
2812	Drumelzer.. ..	5 years	J. R. McKenzie ..	Glenroy Special Exam.	16.7.15	E.A.K.
2851	Drum Style ..	5 years	R. Stewart ..	Kyabram ..	19.8.15	W.J.C.
2897	Fashion of the Day ..	5 years	D Murphy ..	Echuca Special Exam.	6.10.15	W.M.L.
2834	Fashion's Pride ..	5 years	A. D. McLarty ..	Swan Hill ..	11.8.15	W.M.L.
2878	Federal Clansman ..	5 years	McDonald and Draper	Yarra Glen Special Exam.	7.9.15	W.M.L.
2846	Federal Tax ..	5 years	C. N. Davies ..	Rochester ..	17.8.15	W.J.C.
2884	General Scott ..	5 years	A Strawhorn ..	Kyneton ..	7.9.15	R.G.
2803	Glenbarr	5 years	McDougall Bros.	Ararat	5.7.15	R.G.
2895	Glenmarkie ..	6 years	J. McRae ..	Romsey.. ..	29.9.15	R.N.J.
2868	Grampian Star ..	5 years	D. McDonald ..	Camperdown ..	25.8.15	R.N.J.
2826	Hamilton's Pride ..	5 years	King Bros. ..	Birchip	3.8.15	W.M.L.
2857	Khartoum ..	5 years	T. Wignell ..	Euroa	20.8.15	W.J.C.
2847	Kilburnie	5 years	A. Yeaman ..	Rochester ..	17.8.15	W.J.C.
2800	King of the Kings..	5 years	O. Maroske ..	Horsham ..	6.7.15	R.G.
2825	King of the Valley ..	5 years	C. B. Woodyard ..	Wangaratta ..	5.8.15	R.N.J.
2836	Laird of Selkirk ..	5 years	W. Troy ..	Kerang	12.8.15	W.M.L.
2818	Lanark Again ..	5 years	W. J. Moll ..	Dimboola ..	3.8.15	R.G.
2848	Lord Huntley ..	5 years	A. W. Butcher ..	Rochester ..	17.8.15	W.J.C.
2850	Major Lawrence ..	5 years	Berryman Bros. ..	Echuca	18.8.15	W.J.C.
2872	Mount Everest ..	6 years	J. A. McKenzie ..	Werribee ..	28.8.15	R.G.
2830	Newfield's Baron ..	5 years	J. Duxson ..	St. Arnaud ..	6.8.15	W.M.L.
..	Newton Stewart ..	5 years	W. Crozier ..	New South Wales Exam.	27.3.15	..
2853	Noble Knight ..	5 years	R. Barron ..	Tatura	19.8.15	W.J.C.
2863	Overton	5 years	A. McCallum ..	Jeparit ..	20.8.15	R.N.J.
2835	Premier Darnley ..	5 years	A. Lowrie ..	Swan Hill ..	11.8.15	W.M.L.
2808	Premier Glenorchy..	5 years	Coonan and Caffrey	City Horse Bazaar	19.7.15	W.M.L.
2831	Premier Jack ..	5 years	G. Oxley, junr. ..	St. Arnaud ..	6.8.15	W.M.L.
2875	Prince Aldie ..	5 years	Brock Bros. ..	Trafalgar ..	3.9.15	R.G.
2817	Prince Edward ..	5 years	D. King and Sons	Rutherglen ..	2.8.15	R.N.J.
2854	Prince Imperial ..	5 years	A. Minchin ..	Tatura	19.8.15	W.J.C.
2821	Prince of Nullan ..	5 years	J. Annison ..	Warracknabeal ..	6.8.15	R.G.
2869	Referee	5 years	W. T. Manifold ..	Camperdown ..	25.8.15	R.N.J.
2887	Rob Roy	5 years	G. Butler ..	Maryborough ..	9.9.15	R.G.
2873	Royal Navy ..	5 years	J. McIlwain ..	Maffra	2.9.15	W.M.L.
2871	Scotland's Bloom ..	5 years	J. Wylie ..	Colac	27.8.15	R.N.J.
2838	Scottie	5 years	Hansen Bros. ..	Numurkah ..	11.8.15	R.N.J.
2860	Scotty Chief ..	5 years	A. Rintoul ..	Nhill	18.8.15	R.N.J.
2882	Shanter	5 years	O. Syme ..	Gisborne Special Exam.	7.9.15	R.G.
2890	Sir Alick	5 years	Tippett Bros. ..	Ballarat ..	10.9.15	R.G.
2880	Sir Donald's Pride..	5 years	J. Gregg ..	Korumburra ..	8.9.15	W.M.L.
2894	Sir Knight ..	5 years	Mitchell and O'Brien	New Zealand Exam.	6.9.15	..
2855	Sir Mac	5 years	A. J. Donaldson..	Tatura	19.8.15	W.J.C.
2861	Stockman ..	5 years	C. H. Perkins ..	Rainbow ..	19.8.15	R.N.J.
2886	Territorial.. ..	6 years	F. D. McGauran..	Yarram ..	9.9.15	W.M.L.
2862	The Crown ..	5 years	S. Atwell ..	Rainbow ..	19.8.15	R.N.J.
2807	The Leader ..	5 years	J. B. Jackson ..	Hamilton ..	14.7.15	R.G.

SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
			DRAUGHTS—*continued.*			
2864	Topgallant ..	5 years	F. L. McIntosh ..	Jeparit	20.8.15	R.N.J.
2801	Warkworth's Pride..	6 years	G. Harris ..	Horsham ..	7.7.15	R.G.
2822	Wimmera Prince ..	5 years	C. Hewitt and Sons	Warracknabeal ..	6.8.15	R.G.
2837	Young Herod ..	5 years	A. R. Douglas ..	Kerang	12.8.15	W.M.L.
2883	Young Lord Lyon ..	6 years	W. and G. Main	Kyneton ..	7.9.15	R.G.
			THOROUGHBREDS.			
2904	Border King ..	6 years	P. Uren ..	Werribee ..	20.10.15	R.G.
2814	Doongara	5 years	J. R. Henry ..	Newmarket ..	26.7.15	R.N.J.
2816	Falmouth ..	7 years	A. F. Cullen ..	Rutherglen ..	2.8.15	R.N.J.
2876	Nadir	Aged	D. McIntosh ..	Melton	4.9.15	W.M.L.
2810	Problematic ..	5 years	H. T. Rust ..	City Horse Bazaar	19.7.15	R.G.
2811	The Vanquisher ..	Aged	Coonan and Caffrey	City Horse Bazaar	19.7.15	W.M.L.
			LIGHT HORSES.			
2806	Aristocrat ..	5 years	H. Jeltz ..	Hamilton ..	14.7.15	R.G.
2842	Billie Wilks ..	5 years	T. Moore ..	Shepparton ..	12.8.15	R.N.J.
2843	Cathedral Chimes ..	6 years	J. J. Mitchell ..	Northcote Special Exam.	13.8.15	R.G.
2823	Doctor Jack ..	6 years	J. H. Byron ..	Minyip	5.8.15	R.G.
2824	Don Alto	7 years	G. Maxwell ..	Wangaratta ..	5.8.15	R.N.J.
2866	Emulator's Pride ..	5 years	W. MacArthur ..	Camperdown ..	25.8.15	R.N.J.
2879	E.Y.O.	5 years	J. N. Bowman ..	Korumburra ..	8.9.15	W.M.L.
2865	Harry Alto ..	6 years	A. G. Hunter ..	Seymour ..	25.8.15	R.G.
2874	Honest Wilks ..	5 years	F. English ..	Trafalgar ..	3.9.15	R.G.
..	Len Rose II. ..	..	R. McNair ..	Tasmanian Exam.	8.8.14	..
2898	Lord Lindsy ..	7 years	R. London ..	Maldon Special Exam.	26.10.15	R.G.
2832	Match It	5 years	R. J. Wakeman and Sons	Pyramid ..	9.8.15	W.M.L.
2802	Obligation ..	5 years	J. McClounan ..	Horsham ..	7.7.15	W.M.L.
2809	Pride of Rothschild	7 years	Mitchell and O'Brien	City Horse Bazaar	19.7.15	R.G.
2844	Prince Harold Junior	5 years	H. A. Hussey ..	New South Wales Exam.	23.2.10	..
2849	Siam	5 years	R. Hunter ..	Rochester ..	17.8.15	W.J.C.
2877	Smoodger ..	Aged	R. F. England ..	Craigieburn Special Exam.	4.9.15	R.N.J.
2881	True Royal ..	5 years	F. Mackin ..	Korumburra ..	8.9.15	W.M.L.
2828	White Stockings ..	7 years	L. Brooks ..	Ouyen	5.8.15	W.M.L.
2839	Zolock O. ..	5 years	D. McLeod ..	Numurkah ..	11.8.15	R.N.J.
			PONIES.			
2815	Assembler ..	5 years	F. Watson ..	Ararat	5.7.15	R.G.
2885	Brightlight ..	5 years	J. M. Brown ..	Yarram ..	9.9.15	W.M.L.
2858	Dandy Hero ..	5 years	E. Brock ..	Sea Lake ..	20.8.15	W.M.L.
2902	Dandy Nut ..	5 years	E. E. Small ..	French Is. Special Exam.	15.11.15	R.G.
2870	First Office ..	6 years	W. J. Trask ..	Colac	27.8.15	R.N.J.
2859	Gibbie	5 years	W. Sanders ..	Nhill	18.8.15	R.N.J.
2867	Gold Top ..	5 years	D. McDonald ..	Camperdown ..	25.8.15	R.N.J.
2900	Grainmyr	5 years	E. Whiting ..	Alexandra ..	11.11.15	R.G.
2892	Hauteur	6 years	R. V. Kelly ..	Melbourne ..	21.9.15	W.M.L.
2852	King Tony ..	5 years	J. H. Hunt ..	Kyabram ..	19.8.15	W.J.C.
2891	Leo	5 years	J. Brown ..	Agricultural Offices	11.9.15	W.M.L.
2833	Raouf	Aged	Dr. J. P. Ryan ..	Agricultural Offices	14.8.15	W.M.L.
2888	Sparrow	6 years	R. Jukes ..	Maryborough ..	9.9.15	R.G.
2899	The Joker.. ..	6 years	W. R. Williams ..	Maldon Special Exam.	26.10.15	R.G.
2901	Tim Brigham ..	Aged	G. Payne ..	Alexandra ..	11.11.15	R.G.

LIST OF TERMINABLE CERTIFICATED STALLIONS.

Four-year-old Certificates expiring 30th June, 1916.)

DRAUGHTS.

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
1061/4	Abbot's Pride	J. Grant	Melbourne	21.9.15	R.N.J.
1017/4	Arawa	J. R. McKenzie	Glenroy Special Exam.	16.7.15	E.A.K.
1023/4	*Baron Abbot*	*McNamara and McDougall*	*Yarrawonga*	*3.8.15*	*R.N.J.*
1025/4	Baron Milford	A. C. Petrass	Minyip	5.8.15	R.G.
1060/4	Baron Northcote	R. H. Grant	Ballarat	10.9.15	R.G.
1062/4	*Baron Samson*	*J. Grant*	*Melbourne*	*21.9.15*	W.M.L.
1041/4	Baron Twist	E. and C. Ham	Rochester	17.8.15	W.J.C.
1022/4	British Hope	J. R. Henry	New Zealand Exam.	1.7.15	..
1034/4	Clan McGregor	Dookie Agricultural College	Dookie	9.8.15	R.N.J.
..	Clermont	G. C. Dufty	Nhill	18.8.15	R.N.J.
1039/4	Colonel Young	H. W. Oberin	Elmore	13.8.15	W.M.L.
1024/4	Duke of Dahlen	H. C. Jorgensen	Dimboola	3.8.15	R.G.
1019/4	Earl Dundonald	J. R. Henry	Newmarket	26.7.15	R.N.J.
1042/4	Federal Duke	E. Williamson	Charlton	18.8.15	W.M.L.
1015/4	Forward	E. M. Walter	City Horse Bazaar	19.7.15	W.M.L.
1035/4	Invermay	A. Colvin	Nathalia	11.8.15	R.N.J.
1020/4	Johnnie Walker	J. R. Stokes	Newmarket	26.7.15	R.N.J.
1056/4	King Albert	T. McKay	Kyneton	7.9.15	R.G.
1043/4	Lyndale	A. McKinnon	Charlton	18.8.15	W.M.L.
1016/4	Lord Everest	J. White	City Horse Bazaar	19.7.15	R.G.
1040/4	Model King	H. Boyd	Elmore	13.8.15	W.M.L.
1027/4	Newton Prince	H. C. Younger	Wangaratta	5.8.15	R.N.J.
1044/4	Orbost Again	P. A. Deckert	Nhill	18.8.15	R.N.J.
1063/4	Plunket's Pride	J. Helding	Melbourne	21.9.15	W.M.L.
1032/4	Premier Thomas	W. MacKnight	Swan Hill	11.8.15	W.M.L.
1011/4	Royal Salute	Fodey Bros.	Horsham	7.7.15	R.G.
1048/4	Royal Son	J. J. Gleeson	Warrnambool	26.8.15	R.N.J.
1036/4	Saxon Prince	T. Wearne	Numurkah	11.8.15	R.N.J.
1021/4	Scottie	G. W. Francis	Newmarket	29.7.15	R.N.J.
1059/4	*Scottish Chief*	*J. Galloway*	*Maryborough*	*9.9.15*	*R.G.*
1029/4	Shepherd King	J. Erwin, sen.	Pyramid	9.8.15	W.M.L.
1045/4	Starlight	G. J. Blythman	Nhill	18.8.15	R.N.J.
1038/4	Thorn Blend	J. Alexander	Shepparton	12.8.15	R.N.J.
1065/4	Young McClelland	H. McKinley	Romsey	29.9.15	R.N.J.

THOROUGHBRED.

1057/4	Bengore	J. Blair	Yarram	9.9.15	W.M.L.

LIGHT HORSES.

1054/4	Belmont Chimes	Belmont Stud Farm	Melbourne Special Exam	2.9.15	R.N.J.
1051/4	Blue Wilks	J. W. McNeill	Colac	27.8.15	R.N.J.
1046/4	Bonnie Palm	W. H. Pollack	Jeparit	20.8.15	R.N.J.
1047/4	Corva	A. G. Hunter	Seymour	25.8.15	R.G.
1037/4	Elect Wood	H. A. Fisher	Shepparton	12.8.15	R.N.J.
1050/4	Federal Chimes	D. Rowe	Camperdown	25.8.15	R.N.J.
1053/4	Marcus	N. Jones	Werribee	28.8.15	R.G.
1066/4	Nugong	T. N. Lade	Yea	19.10.15	R.N.J.
1058/4	Orient	D. Rodgers	Yarram	9.9.15	W.M.L.
1030/4	Straightway	L. Taylor	Pyramid	9.8.15	W.M.L.
1055/4	Sunny Voyage	J. M. Roche	Trafalgar	3.9.15	R.G.
1026/4	Wiltshire	A. A. Habel	Minyip	5.8.15	R.G.

LIST OF TERMINABLE CERTIFICATED STALLIONS—*continued.*

PONIES.

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
1028/4	Arabian	D. Fuller	Ouyen	5.8.15	W.M.L.
1049/4	Commodore Nut	W. T. Manifold	Camperdown	25.8.15	R.N.J.
1012/4	*Cymro*	*Dempster Bros.*	*Hamilton*	14.7.15	R.G.
1031/4	Dandy Lion	Hon. J. Gibb	Geelong	12.8.15	R.G.
1018/4	Gay Gordon	J. R. McKenzie	Glenroy Special Exam.	16.7.15	E.A.K.
1052/4	Golden Locke	J. James	Colac	27.8.15	R.N.J.
1013/4	Harry Lauder	L. H. Fraser	Hamilton	14.7.15	R.G.
1014/4	Moonee Vale	J. McPhail	Agricultural Offices	17.7.15	W.M.L.
1064/4	Romance	Ingram Bros.	Melbourne	21.9.14	R.G.
1067/4	Stealaway	H. Sawers	Alexandra	11.11.15	R.G.

(Three-year-old Certificates expiring 30th June, 1916.)

DRAUGHTS.

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
1577/3	Abbot's Best	J. Egan	City Horse Bazaar	19.7.15	W.M.L.
1601/3	Abbotsford Champion	C. Elphick	New Zealand Exam.	14.6.15	..
1600/3	Abbotsford Signet	M. Hearne	New Zealand Exam.	14.6.15	..
1608/3	Aberdeen	Carnie Bros.	Numurkah	11.8.15	R.N.J.
1591/3	Albert McDonald	S. Spittle	Newmarket	26.7.15	R.N.J.
1578/3	Baron Abbott	P. McDonald	City Horse Bazaar	19.7.15	W.M.L.
1596/3	Baron Alexander	R. N. Scott	New Zealand Exam.	2.7.15	..
1579/3	Baron Black	Mitchell and O'Brien	City Horse Bazaar	19.7.15	W.M.L.
1612/3	Baron Carlyle	A. Gillies	Werribee Special Exam.	18.8.15	E.A.K.
1605/3	Baron Carrick	R. C. Hannah	Donald	2.8.15	W.M.L.
1592/3	Baron Cedric	J. R. Henry	Newmarket	26.7.15	R.N.J.
1574/3	Baron Cowden	Mitchell and O'Brien	New Zealand Exam.	17.5.15	..
1569/3	Baron Ramsay	J. Harry and Sons	Horsham	6.7.15	R.G.
1598/3	Baron William	N. Ramsay	New Zealand Exam.	2.7.15	..
1622/3	Belmont's Champion	Turner Bros.	Mernda	8.9.15	R.G.
1599/3	Bold Boy	C. Wragge	New Zealand Exam.	2.7.15	..
1588/3	Bonnie Baron	S. J. Berryman	City Horse Bazaar	20.7.15	W.M.L.
1609/3	Bonnie Belmont	W. Williams	Cobram	10.8.15	R.N.J.
1595/3	Criterion	H. Saunders	New Zealand Exam.	2.7.15	..
1580/3	Denmark	A. McWhinney	City Horse Bazaar	19.7.15	R.G.
1568/3	Dunkirk	P. Tenison	Melbourne Special Exam.	4.5.15	E.A.K.
1572/3	Dunsmore Menestral	R. Tucker	Horsham	7.7.15	R.G.
1593/3	Forrester	C. Liesfield	Newmarket	26.7.15	R.N.J.
1629/3	Gallipoli	W. Tallent	Ballarat	10.9.15	R.G.
1625/3	Gay Lad	J. Jamieson	Yarram	9.9.15	W.M.L.
1639/3	General Bridges	A. W. Findley	Leongatha Special Exam.	23.2.16	R.G.
1611/3	Glencoe	L. McLeod	Shepparton	12.8.15	R.N.J.
1635/3	Handsome Lad	A. M. Kerlin	Rochester Special Exam.	5.10.15	W.M.L.
1581/2	Harry Lauder	Mitchell and O'Brien	City Horse Bazaar	19.7.15	W.M.L.
1613/3	Ian King	Schubert Bros.	Sea Lake	20.8.15	W.M.L.
1597/3	Lee Creek Squire	W. Underwood	New Zealand Exam.	2.7.15	..
1624/3	Lucky Jim	R. J. Robertson	Kyneton	7.9.15	R.G.
1628/3	Lord Melbourne	J. Douglas	Maryborough	9.9.15	R.G.
1576/3	Lord Valcourt	J. H. Roulston	Coleraine	13.7.15	R.G.
1582/3	Lord Wigton	Mitchell and O'Brien	City Horse Bazaar	19.7.15	W.M.L.
1630/3	Marcilea	J. Smith and Son	Leongatha	10.9.15	W.M.L.
1618/3	Onward's Star	W. Powles	Congupna Special Exam.	26.8.15	R.G.
1583/3	Patriot	H. A. Armytage	City Horse Bazaar	19.7.15	R.G.
1621/3	Prince Alexander	J. B. Talbot	Maffra	2.9.15	W.M.L.
1603/3	Queen's First	P. Müller	Dimboola	3.8.15	R.G.
1584/3	Red Cross	Mitchell and O'Brien	City Horse Bazaar	19.7.15	W.M.L.
1638/3	Ripplevale	J. J. Downey and Sons	Ballarat Special Exam.	28.10.15	Appeal Board
1623/3	Royal Belmont	Turner Bros.	Mernda	6.9.15	R.G.
1610/3	Royal Colours	T. Thornton	Numurkah	11.8.15	R.N.J.

List of Terminable Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
	Draughts—*continued.*				
1570/3	Shepherd Style ..	O. Maroske ..	Horsham	6.7.15	R.G.
1641/3	Squire Harold ..	Mitchell and O'Brien	New Zealand Exam. ..	7.3.16	..
1590/3	Squire William ..	Mitchell and O'Brien	New Zealand Exam. ..	15.6.15	..
1627/3	Tarra Nobleman ..	W. Cockbill ..	Yarram	9.9.15	W.M.L.
1585/3	The Bard	L. J. Weatherly ..	City Horse Bazaar ..	19.7.15	W.M.L.
1633/3	The Lion	G. Fairbairn ..	South Australian Exam.	14.7.15	..
1631/3	The Reformed Fashion	J. Burns	New Zealand Exam. ..	23.6.15	..
1586/3	*The Saxon*	*Col. W. J. Clark* ..	*City Horse Bazaar* ..	*19.7.15*	*R.G.*
1571/3	Victor Hugo	T. Maddern ..	Horsham	6.7.15	R.G.
1587/3	Willaston Glen ..	J. R. Stokes ..	City Horse Bazaar ..	10.7.15	R.G.
1594/3	Winter's Pride ..	Mitchell and O'Brien	Newmarket	28.7.15	R.G.
1615/3	Young Hero	J. Vennell ..	Nhill	18.8.15	R.N.J.
1614/3	Young Kelmscott ..	H. Thompson ..	Kaniva	17.8.15	R.N.J.
	LIGHT HORSES.				
1606/3	Al Borak	T. McCarthy ..	Mildura	4.8.15	W.M.L.
1619/3	*Bold Rowan*	McNeill Bros. ..	Colac	27.8.15	R.N.J.
1620/3	Delicious	J. Browne.. ..	Werribee	28.8.15	R.G.
1637/3	Direct Lulu	R. Linden ..	Maldon	26.10.15	R.G.
1617/3	Fleetfoot	P. Fisher	Jeparit	20.8.15	R.N.J.
1636/3	Gospel Bells	G. H. Alford ..	Brighton Special Exam.	26.10.15	E.A.K.
1573/3	Gratton Again ..	W. J. Parish ..	Horsham	7.7.15	W.M.L.
1640/3	King Wilks	J. Bright	Leongatha Special Exam.	23.2.16	R.G.
1607/3	Merrimu	G. M. Vallence ..	Kerang	12.8.15	W.M.L.
1626/3	Muskaloon	C. Barlow ..	Yarram	9.9.15	W.M.L.
1604/3	Sir Iver	J. Bunge	Warracknabeal ..	6.8.15	R.G.
	PONIES.				
1632/3	Berkeley Swell ..	D. J. Reen ..	Melbourne	21.9.15	W.M.L.
1602/3	Dandy Claud ..	E. W. Neck ..	Bendigo	29.7.15	R.G.
1634/3	Viscount	P. Quirk	Romsey	29.9.15	R.N.J.

(Two-year-old Certificates expiring 30th June, 1916.)

DRAUGHTS.

246/2	*Lord Salisbury* ..	*R. McKenzie* ..	Warracknabeal ..	6.8.15	R.G.
248/2	Royal Charm ..	F. N. Sallmann ..	Nhill	18.8.15	R.N.J.
245/2	The Standard.. ..	G. W. Pickford ..	Horsham	7.7.15	W.M.L.

PONY.

247/2	Crown Prince ..	J. A. Lane ..	Euroa	20.8.15	W.J.C.

RESULTS OF EXPERIMENTS, 1915.

II. (*Continued from page* 152).

1.—LIGHT AND HEAVY DRESSINGS OF SUPERPHOSPHATE.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

The question of the quantity of manure to apply per acre to a wheat crop is of perennial interest to farmers. The seasonal conditions, quality of soil, amount and distribution of rainfall during the growing period and the methods of cultivation practised largely determine the actual amount.

The majority of our wheat soils are naturally deficient in soluble phosphates, and as the size of the crop is governed by the amount of the most deficient plant food present, it follows that from a nutritive point of view the amount of soluble phosphate in the soil is one of the limiting factors in crop production.

View of Permanent Fertilizer Plots, State Research Farm, Werribee.

Researches carried out in the chemical laboratory of this Department during the past year show that immediately superphosphate is applied to the soil it commences to revert into other forms. It changes more or less rapidly into citrate soluble phosphate, and a small portion becomes converted into insoluble phosphate. This process is called reversion, and the rate at which it proceeds depends on the type of soil.

Investigations have been conducted with typical wheat soils from various parts of the State to find out, (1) the rate at which reversion takes place with light and heavy dressings of super. and (2) the influence of the nature of the soil on the rate of change. The results of these investigations are approaching completion, and will be presented in due course. Suffice it to say for the present that the tests show that more than half of the water soluble phosphate in super. is reverted to citrate soluble phosphate within a week of its application, and that within a month practically the whole of the soluble phosphate is so converted.

Why, it may be asked, need we manufacture at considerable cost superphosphate from insoluble phosphates if this process of reversion takes place so quickly in our wheat lands. The explanation is probably as follows:—

Before the superphosphate reverts the soluble phosphate, which is its essential constituent, becomes dissolved in the soil water, and assumes a form infinitely more minute than can ever be attained by mechanical grinding. In this minute form it gets distributed evenly throughout the surface soil. Its superiority is due to its fineness of subdivision and its intimate diffusion through the soil.

Reversion of the water soluble phosphate takes place shortly after application of the super. to the soil; but wherever the root hairs of the plant may penetrate small quantities of citrate soluble phosphate in the most minutely subdivided form are everywhere awaiting absorption.

For the past three years tests have been conducted at the State Farms with the object of finding out the most profitable rate at which superphosphate could be applied per acre, and the results are summarized in the following tables.

The results are interesting inasmuch as they show the gross returns and net profits per acre (1) in wet seasons and (2) over an average of years.

The results in the case of Rutherglen are on an average of four years, and those of Werribee and Longerenong for three years.

I.

Returns from Plots treated with Light and Heavy Dressings of Superphosphate, Season 1915.

—	Rutherglen.	Werribee.	Longerenong.	Average Returns from Three Centres.
No manure ..	6·0	20·0	37·5	21·0
½ cwt. Super. ..	10·8	27·5	49·4	29·2
1 cwt. Super. ..	15·6	28·75	51·3	31·9
2 cwt. Super. ..	12·0	28·0	54·7	31·6

II.

Average Yields for three seasons (1913–15) from Light and Heavy Dressings of Superphosphate.

—	Longerenong.	Rutherglen.	Werribee.	Average of All Centres.
No manure ..	19·3	9·4	11·0	13·2
½ cwt. Super. ..	26·7	13·9	16·0	18·9
1 cwt. Super. ..	28·8	16·6	17·4	20·9
2 cwt. Super. ..	30·2	16·2	18·0	21·3

III.

Average net profits per acre from Light and Heavy Dressings of Superphosphate over unmanured plots for the Season 1915—Longerenong, Rutherglen, and Werribee combined.

Plot.	Average Yield for Three Centres.	Increase over no Manure Plot. Bush.	Value of Increase, at 3s. 4d. Per Bush.	Cost of Manure.	Net Profit per acre over no Manure.
			£ s. d.	£ s. d.	£ s. d.
No manure .. .	21·0	..	..	..	..
½ cwt. Super.	29·2	8·2	1 7 4	0 2 6	1 4 10
1 cwt. Super.	31·9	10·9	1 16 4	0 5 0	1 11 4
2 cwt. Super.	31·6	10·6	1 15 4	0 10 0	1 5 4
Average net profits per acre from Light and Heavy Dressings of Superphosphate over unmanured plots from all centres for Seasons 1913–14–15.					
No manure	13·2	..	..	..	..
½ cwt. Super.	18·9	5·7	0 19 0	0 2 6	0 16 6
1 cwt. Super.	20·9	7·7	1 5 8	0 5 0	1 0 8
2 cwt. Super.	21·3	8·1	1 7 0	0 10 0	0 17 0

These four tables show conclusively that dressings of 1 cwt. of super. give a higher net return per acre after deducting the cost of manure than light dressings of ½cwt. per acre; and this is not only true in good seasons such as the one we have just experienced, but is also true of normal and droughty years.

Last year the half-hundredweight dressing gave an average net profit over the unmanured plot of £1 4s. 8d. per acre. In the case of the hundredweight dressing, however, the net profit per acre was £1 11s. 4d. per acre *after deducting the cost of the manure.*

For the past three years (which include the drought year) the average net profit per acre from all centres was 20s. 8d. per acre from the heavy dressing, as compared with 16s. 6d. per acre from the lighter application.

In these calculations the price of wheat was taken at 3s. 4d. per bushel. At present prices the net profits would be correspondingly greater. Moreover in addition to the direct returns as measured by grain yields, *it must not be forgotten that* the indirect returns from the grazing of sheep would be much greater with the heavy dressings than with the lighter dressings.

2.—GREEN MANURE TESTS.

One of the problems *confronting* every *wheat-grower* in the *drier* districts is to extract from the soil the highest possible wheat yield, and at the same time maintain unimpaired the productive power of the soil. In the oldest wheat districts there is evidence that some of the practices in vogue are slowly depleting the soil of its organic matter, which is the basis of soil fertility and productiveness.

Bare-fallowing is generally admitted to be the best preparation for a wheat crop in the drier districts, but it has two manifest objections. *The land is lying idle for a whole year, bringing in no return;* and, moreover, the practice of bare-fallowing in our dry climate undoubtedly leads to losses of organic matter.

Where land is cheap and has not long been cropped, these objections possibly do not carry weight. Where land values are high and wheat-growing has been practised for a generation, the matter is more serious. Instead of a year of idleness the land could be made in winter to produce some crop other than wheat, to be fed down by sheep, and subsequently worked through the summer as a partial fallow for a subsequent wheat crop. The practical question, however, is, would such procedure pay.

To answer this question was the objective of a set of experiments at the State Research Farm, Werribee, and while only two years' results are available, the figures obtained are certainly suggestive. Three years ago a set of twenty 1-acre plots were marked out at Werribee. Ten were sown with forage for feeding off and ploughing in, whilst ten were sown with wheat. By alternating the ten forage plots with the ten wheat plots each year, comparative results will be obtained of the value of wheat after each of the forages when fed off as compared with wheat following the same forages ploughed in.

General View of Green Manure Trials, State Research Farm, Werribee, showing method of feeding off Rye and Vetches and Cape Barley with Sheep.

The average results for the two seasons 1914-15 are as follow:—

TABLE I.—RETURNS FROM WHEAT PLOTS GROWN IN ROTATION WITH FORAGES FED OFF AND FORAGES PLOUGHED IN.

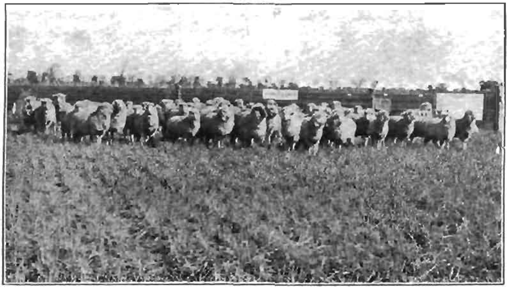
—	1914.		1915.		Average Yields for Seasons 1914–1915.	
	Bus	lbs.	Bus.	lbs.	Bus.	lbs.
1. Wheat after Rape Fed Off	16	48	16	41	16	44½
2. Wheat after Barley ,, ...	16	43	19	21	18	2
3. Wheat after Pease ,, ...	18	39	21	35	20	7
4. Wheat after Vetches ,, ...	17	21	18	4	17	42½
5. Wheat after bare-fallow	20	12	21	44	20	58
6. Wheat after Rape, Ploughed in ..	18	9	21	23	19	46
7. Wheat after Barley ,, ..	16	58	20	40	18	49
8. Wheat after Pease ,, ..	16	27	23	17	19	52
9. Wheat after Vetches ,, ..	15	26	20	12	17	49
10. Wheat after bare-fallow (manured) ..	21	22	23	29	22	25½

Note.—Plot 10 (Bare-fallow) received a double dose of manure, 1 cwt. being sown during fallowing operations, and 1 cwt. being sown with the wheat crop. Plot 5 received 1 cwt. when sown with wheat.

It will be noticed that the differences between the bare-fallow and the remaining plots were very marked in 1914 (the drought year), but that in 1915 two of the plots, viz., wheat after peas, both fed off and ploughed in, gave better returns than the corresponding plot of bare-fallow (Plot 5).

The results demonstrate that the yield of wheat grown after forages fed off with sheep are nearly as high as those in which the green crop was ploughed under. Neither systems, however, give as high a yield as bare-fallow, as might have been expected in a district where soil moisture is the limiting factor to crop production.

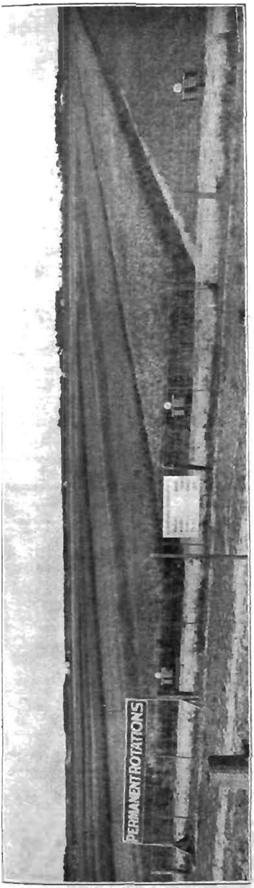
The net profit per acre obtained by growing wheat in rotation with forages fed off is, however, much higher than than after bare-fallow. In order to assess the cash value of the forages fed to the sheep, the increase of live weight in sheep during the depasturing of the crop was obtained by weighing a given number of sheep on and off the plots. The increase in live weight has been reckoned at 2d. per lb., and the increased value of the wool at 1½d. per head per week.



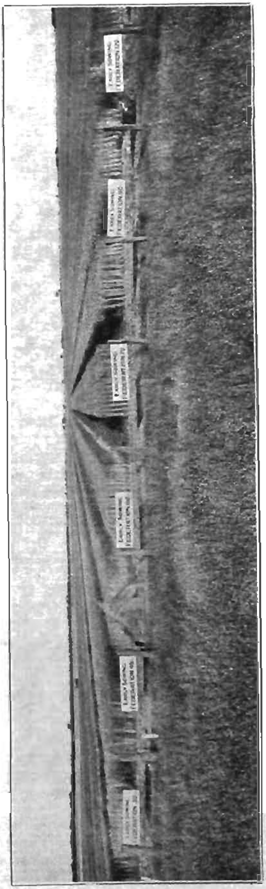
Green Manure Trials—Feeding off Cape Barley with Sheep.

This method of determining the value of the pasture has its limitations, but it gives a good idea of the relative stock-carrying capacity of each fodder. The results are summarized in the table.

—	Average Value of Fodder Crops in Seasons 1913–14.			Average Value of Wheat Crop at 4s. per bushel, 1914–15.			Average Gross Return for two years.		
	£	s.	d.	£	s.	d.	£	s.	d.
Plot 1. Rape	1	15	9	3	6	11	5	2	8
„ 2. Barley	2	13	1	3	12	2	6	5	3
„ 3. Pease	1	16	2	4	0	6	5	16	8
„ 4. Rye and Vetches	2	18	11	3	10	10	6	9	9
„ 5. Bare-fallow		..		4	3	11	4	3	11



View of Permanent Rotation Plots, State Research Farm, Werribee.



View of Experimental Wheat Plots, showing rate of seeding and time of sowing trials, Wyuna State Farm.

It will be seen that over a two years period a crop of wheat grown after bare-fallow gave a gross return of £4 3s. 11d. When grown in rotation with barley, rye and vetches fed off the gross returns range from £6 5s. 3d. to £6 9s. 9d. per acre—an increase over the bare-fallowed plot of £2 1s. 4d. and £2 5s. 10d. per acre.

The fodder crops were treated as catch crops, and the cost of cultivation, including seed and manure did not exceed 25s. per acre; consequently the net profit by growing wheat in rotation with forages fed off was, approximately, £1 per acre greater than growing wheat after bare-fallow.

The results are the more striking in that they include the drought year of 1914.

Precisely similar results were obtained at Rutherglen. In districts similarly situated to Werribee, enjoying a rainfall of 20 inches or over, the growing of wheat in rotation with forages fed off is likely to give bigger net returns than by growing wheat after bare-fallow. This applies particularly to the Western District wheat country and portions of the North-East and Gippsland.

3.—RATE OF SOWING AND TIME OF SEEDING TRIALS.

During the past year a series of tests were carried out to determine the differences between early sowing and late sowing of early, midseason, and late varieties. Marshall's No. 3, Yandilla King, Federation, King's Early, and Gluyas wheats were sown in one batch on 16th April, 1915, and a second batch on 5th June at the State Research Farm, Werribee. The former date corresponds roughly to the beginning of the seeding in normal seasons, and the latter date agrees approximately with the completion of seeding. The plots were sown on worn-out clay land.

The results were as follows:—

Early Sowing (16th April).

	Bush.	lbs. per acre.
Marshall's No. 3	22	24
Yandilla King	24	32
Federation	21	20
King's Early	19	20
Gluyas	18	40

Late Sowing (5th June).

	Bush.	lbs. per acre.
Marshall's No. 3	21	4
Yandilla King	21	52
Federation	17	20
King's Early	26	24
Gluyas	24	48

Rainfall during the Growing Period.

Early sown plots, 10.8 inches.

Late sown plots, 8.65 inches.

It will be seen that the midseason and late maturing varieties, *e.g.*, Federation, Marshall's, and Yandilla King gave best results when sown early, the three early sown plots averaging 2 bushels 40 lbs. more per acre than the same varieties sown late. On the other hand, the early

maturing wheats, Gluyas and King's Early, with a short growing period, gave 6 bushels 36 lbs. more per acre when sown late in the season than when sown early. Similar results were obtained at other centres.

These results imply that the seeding season may be protracted if the farmer uses a judicious selection of early and late maturing wheat varieties. The seeding should be commenced with the late maturing types, such as Yandilla King, Marshall's No. 3, followed by midseason types as Federation, and the early maturing varieties such as Gluyas, Bunyip, and King's Early should be reserved until the completion of seeding.

The rate of seeding is closely connected with the time of sowing. Wheat sown early on well prepared land requires the minimum amount of seed.

The temperatures in April and early May favour speedy germination and vigorous healthy stooling. At the end of June the soil temperatures approach 41 deg. F., the temperature at which germination and plant growth are suspended.

Seed sown late needs thicker seeding to counteract the lessened germination and diminished stooling powers of the plant.

These points are well illustrated in the rate of sowing trials at Wyuna last season with Federation wheat.

EARLY SOWING (May).	Bushels.
30 lbs. per acre	31.4
45 " "	34.5
60 " "	36.6
75 " "	35.8
90 " "	34.7
120 " "	33.2

LATE SOWING (June).	
30 lbs. per acre	28.8
45 " "	27.3
60 " "	31.9
75 " "	34.0
90 " "	35.3
120 " "	32.1

The above table shows that the maximum yield per acre, 36.6 bushels, was obtained by sowing 60 lbs. of seed early in May. In spite of the mildness of the season and the late spring rains, none of the late sown plots quite equalled this yield. The maximum yield on the late sown plots was 35.3 bushels, but in order to secure this yield no less than 90 lbs. of seed per acre had to be used.

The rainfall during the growing period was 12.85 inches.

COST OF PRODUCTION OF FIELD CROPS.

I.—WHEAT.

By H. C. Wilson, Manager, Central Research Farm; and A. J. Whelan, Field Officer, Werribee.

(Continued from page 413, July Journal, 1915.)

In the July number of this *Journal* last year, the costs of preparation, including seeding of a wheat crop at the Central Research Farm, Werribee, was discussed. The present article deals with harvesting expenses of this crop, and presents a balance-sheet.

The results should correspond with costs under similar conditions of soil and climate in other localities.

The July article gave full detailed costs of the operations leading up to and including seeding. (See Table 1.) The field of wheat, which was approximately 345 acres, was looking well and stooling freely when the former article was written.

Harvesting has now been completed, and the detailed costs can be seen in Table No. 2.

In harvesting this field, three separate series of operations were conducted. This was found necessary, because nothing but pure seed wheat was sown, and the crop, comprising some thirteen varieties, was gathered for seed. The three operations consisted of:—

(1) Harvesting 12 acres of headland for hay.
(2) Harvesting with binder 309 acres for threshing.
(3) Stripping and winnowing 24 acres, comprising three varieties, the areas of which were not large enough to be harvested by the threshing method.

Harvesting Headlands for Hay.

A headland of ½ chain of King's Early wheat was sown around this field, and the total, 12 acres, was cut for hay on 20th to 22nd October, 1915. This headland acted as a break for wind and ravages of pests, as well as a protection from the possibility of mixing grain at the ends of the several plots of different varieties sown.

Hay was harvested very early in the season, and valued in the stack, on 10th November, 1915, at £5 per ton.

The total hay harvested from the 12 acres, and weighed over the farm weighbridge before stacking, was 26 tons. Therefore, the gross value amounted to £130.

The cost of all operations connected with the production of this hay, including rent of the land, and a share in the whole of the incidental expenses incurred, was £35 7s. 5d.: which means £2 18s. 11½d. per acre, or £1 7s. 2½d. per ton. It seems, in the face of these figures, that, unless the farmer can realize approximately 30s. per ton for his hay in the stack, even though he has a normal season and a fair crop, the occupation would be unprofitable.

Cutting Crop for Grain, and Threshing.

Harvesting by means of the threshing machine seems the most popular method of handling a wheat crop for grain in this locality.

Firstly, because it has the advantage of a market near at hand for baled straw; and secondly, the damp coastal conditions do not permit of efficient harvesting of large quantities of grain by means of the stripper and winnower, or combined harvester.

Ploughing with Disc Plough, State Research Farm, Werribee.

Ploughing with Mould-board Plough, State Research Farm, Werribee.

Of the 345 acres harvested, 309 acres were cut with the binder for threshing. The work was started on 2nd December, and the separate operations of cutting, stooking, carting, and stacking of wheat in the sheaf, were carried out in December, 1915.

TABLE No. 1.

ACTUAL COST OF WHEAT SEEDING, SEASON 1915.

Tillage Operation.	Date of Operation.	Value per Ton of Oaten Chaff. (s. d.)	Value per Ton of Oaten and Lucerne Chaff Mixed. (s. d.)	Value per Bushel Crushed Oat Seconds. (s. d.)	Value per Ton Beet Sugar Molasses. (s. d.)	Ration Feed to each Horse per Day Average for Team.	No. of Horses Fed.	Cost of Ration per Horse per Day. (s. d.)	Total Cost of Ration per Day per Team. (s. d.)	No. of Days Fed for Operation.	Total Cost of Horse Feed for Operation. (£ s. d.)	No. of Days of Labour Paid.	Rate per Day of Labour Paid. (s. d.)	Total Cost of Labour for Operation. (£ s. d.)	Cost of Oil and Repairs. (s. d.)	10% Depreciation on Value of Implements. (s. d.)	10% Depreciation on Value of Horses. (s. d.)	5% Interest on Value of Implements. (s. d.)	5% Interest on Value of Horses. (s. d.)	Total No. of Acres Cultivated.	No. of Acres per Day per Implement Cultivated.	Cost per Acre of each Operation. (s. d.)	Total Cost of each Operation. (£ s. d.)
Ploughing ..	1914. June 26th 18th Aug.	50 0	..	2 0	..	Oaten Chaff 38 lbs. Oats, seconds, 7 lbs.	12	1 2¾	14 10	54	40 1 0	92	8 0	36 16 0	70 0	13 9	138 0	6 10½	69 0	345	3¼	5 3¼	91 14 7½
Double Harrowing	19th Aug. 3rd Sept.	50 0	..	2 0	..	Oaten chaff, 38 lbs. Oats, seconds, 7 lbs.	12	1 2¾	14 10	16	11 17 4	26	8 0	10 8 0	12 6	2 0	35 0	1 0	17 6	345	26½	0 8 5/16	25 13 4
Harrowing	24th Sept. 11th Oct.	..	70 0	2 3	30 0	Oaten and Lucerne chaff mixed, 31 lbs. Oats, seconds, 2½ lbs. Beet Molasses, 2 lbs.	6	1 1¾	6 10½	18	5 17 0½	10	8 0	5 8 0	6 6	1 2	19 8	0 7	9 10	345	24½	0 9 1/16	18 9 0
Harrowing	28th Nov. 12th Dec.	..	90 0	2 6	30 0	" "	.. 6	.. 1 5¼	.. 8 7½	.. 15	.. 6 9 4	4 13	7 0 7 0	4 11 0	6 2	1 0	16 5	0 6	8 2½	345	26½	0 8¾	12 12 7½
Spike rolling and Harrowing	29th Dec. 1915. 26th Jan.	..	110 0	3 6	30 0	" "	6	1 9	10 6	30	15 15 0	26	7 0	9 2 0	15 0	4 11	32 10	2 5½	16 5	345	13½	1 7¾	28 8 7½
Cultivation, 3¼" deep	26th Jan. 27th Feb.	..	140 0	4 0	30 0	" "	5	2 2½	10 11¾	49	26 15 11	44	7 0	15 8 0	22 0	10 9	45 8	5 4½	22 10	345	7¼	2 9	47 10 6½
Harrowing before drilling	17th April 3rd May	..	180 0	5 0	30 0	" "	6	2 10	17 0	18	15 6 0	15	7 0	5 5 0	6 6	1 2	19 8	0 7	9 10	345	23	1 3¾	22 8 9
Drilling ..	17th April 3rd May	..	180 0	5 0	30 0	" "	8	2 10	22 8	13½	15 6 0	23	7 0	8 1 0	9 0	6 1	20 8	3 0½	10 4	345	15	1 5¾	25 16 1½
Harrowing after drilling	17th April 3rd May	..	180 0	5 0	30 0	" "	6	2 10	17 0	18	15 6 0	15	7 0	5 5 0	6 6	1 2	19 8	0 7	9 10	345	23	1 3¾	22 8 9
Seeding ..	17th April 3rd May	Total graded seed wheat sown, 356½ bushels, at 9s. per bushel = 62 lbs. sown per acre. Cost per acre and total cost of seed wheat ..																			..	9 3¾	160 8 6
Manuring ..	17th April 3rd May	Total superphosphate, 36–38% Sol., 16½ tons, at £4 5s. per ton = 107 lbs. sown per acre. Cost per acre and total cost of manure																			..	4 0¾	70 2 6
		Rent of land, 12s. per acre, for eighteen months. Total cost per acre, £1 10s. 2½d. Total cost, 345 acres, to date .. .. *To be added after harvest = £207 + £4 11s. 6d., temporary improvements.*																			..	..	520 13 10½

TABLE No. 2.

ACTUAL COST OF HARVESTING, SEASON 1915–16.

Harvesting Operations.	*Date of Operation.*	No. of Horses Worked.	No. of Days Worked.	Cost of Horses for each Operation.	No. of Men.	No. of days of Labour.	Rate of Pay Per Day.	Cost of Labour for Operation.	Cost of Binder Twine.	Cost of Oil and *Repairs.*	Depreciation and Interest *on* Implements.	No. of Acres of each Operation.	Cost Per Acre of each Operation.	Total Cost of each Operation.	Total Cost of Harvesting and Produce.
				*2s. 6d. per day. £ *s.* *d.*			*s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*		*s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
Headlands cut for hay ..	20th to 22nd Oct.	3	2	0 15 0	1	2	9 0	0 18 0	1 5 0 (12 balls)	0 5 0	0 10 0	12	6 1	3 13 0	
Stooking, carting, and stacking hay	25th Oct. to 10th Nov.	4	3	1 10 0	2	10	9 0	4 10 0	..	..	0 5 0	12	10 5	6 5 0	9 18 0
Cutting crop for threshing ..	2nd to 18th Dec.	12	15	22 10 0	2	30	10 0	15 0 0	20 8 6 (16 bales)	9 15 0	7 10 0	309	4 5½	69 3 6	
Stooking, Carting, and stacking	10th to 31st Dec.	12	12½	18 15 0	20	250	9 0 (16 men) 10 0 (4 men)	115 0 0	..	..	6 5 0	309	9 1	140 0 0	
Threshing and stacking straw	14th to 31st Jan.	Contract work.			..	..	..	..	..	..	Total cost		..	124 6 11	
Carting wheat to store ..	14th to 31st Jan.	15	9	16 7 6	4	36	7 6	13 10 0	..	..	3 7 6	309	2 2½	33 15 0	
Pressing straw	27th Jan. to 14th Feb.	Contract work.			..	..	..	..	..	..	Total cost		..	200 17 1	
Carting straw to station ..	27th Jan. to 16th Feb.	10	16	20 0 0	2	32	7 6	12 0 0	..	..	4 0 0	309	2 4	86 0 0	
Loading straw on trucks ..	27th Jan. to 16th Feb.	Contract work.			..	..	..	..	..	..	Total cost		..	5 7 6	
Cost of sacks and twine ..				Sacks, £88 3s. 9d.; twine, 30s.				..	..	..	Total		..	89 13 9	699 3 9
Stripping	17th to 23rd Dec.	3	4	1 10 0	1	4	10 0	2 0 0	..	0 6 0	0 12 0	24	3 8	4 8 0	
Winnowing	27th to 31st Dec.	..	..	..	2	4	9 0	3 12 0	..	0 2 0	0 8 0	24	3 5	4 2 0	
Carting wheat to store ..	1st Jan. ..	15	½	1 8 1½	4	3	7 6	1 2 6	..	..	0 3 9	24	2 3	2 14 4½	
Cost of sacks and twine ..				Sacks, £7 4s. 6d; twine, 2s. 6d.				..	..	..	Total		..	7 7 0	18 11 4½
	Temporary improvements, £4 11s. 6d; rent of land, £207 ..											..	..	211 11 6	211 11 6
	Grand total cost of harvesting, &c. ..											..	..	..	939 4 7½

*2s. 6d. per day per horse has been allowed in reckoning the cost of the harvesting operations, and was based on the *cost of feeding with interest and sinking fund added.*

Threshing, stacking straw, and carting wheat to the barn was undertaken from the 14th to the 31st of January last. The straw was baled, carted to the Werribee railway station, and loaded on trucks for sale, from 27th January to 16th February, 1916.

Cutting Wheat for Threshing.

Threshing the Grain.

The weather was very favorable throughout the harvesting operations, and little delay was caused in the work by wet conditions.

Harvesting work was done by the permanent farm hands and temporary harvest workers at the ruling district rates of pay. The cost per acre can be seen in Table No. 2.

Threshing, baling straw, and loading pressed straw on trucks at Werribee railway station, was let to contractors; and this season, because of the high rates of labour, and increased prices of material through the war, the cost for this contract work has advanced 20 per cent.

However, the total cost of the whole of the harvesting operations of the 309 acres, from the time the crop was cut until the wheat was delivered into the barn, and the baled straw loaded on the trucks, inclusive of sacks and twine, was £699 3s. 9d., or £2 5s. 3d. per acre. Add to this the cost last season of all operations up to and including seeding, £1 10s. 2¼d. per acre; rent of land, 12s. per acre; and temporary improvements, which worked out at, approximately, 3d. per acre (see Table No. 1), it will be found that the total cost of production was £4 7s. 8¼d. per acre. The profit on the venture will be seen in the balance-sheet below.

Stripping and Winnowing.

Harvesting wheat by this means is not favoured locally, as previously mentioned; but it was found necessary to strip 24 acres, because the three varieties of grain grown, viz., Dart's Imperial, Commonwealth, and Warden, were in plots which were considered too small to be efficiently handled without loss or chance of mixing the grain by means of the thresher.

On 17th to 23rd December, 1915, stripping of this area was undertaken, and winnowing completed on the 31st. Fortunately, good weather conditions were experienced, and the cost of this method of harvesting will be seen in Table No. 2.

The total, including the cost of sacks, twine, cartage of wheat to the barn of the 24 acres, amount to £18 11s. 4½d., or 15s. 5½d. per acre. Add to this the cost of all operations up to and including seeding, £1 10s. 2¼d., per acre; 12s. per acre, rent of land; 3d. per acre, temporary improvements; and the total is £2 17s. 10¾d. per acre. The profit on this method of producing and harvesting wheat will be noticed in the balance-sheet.

Cost of Production.

The total cost of harvesting the hay, grain, and straw from this 345-acre field was £727 13s. 1½d., or £2 2s. 2¼d. per acre. Add to this the expense incurred in all operations up to and including seeding, together with cost of seed wheat and manure, as detailed in Table No. 1, amounting to £520 13s. 10½d.; also rent of the land, £207; temporary improvements, £4 11s. 6d.; and the grand total amounts to £1,459 18s. 6d., or £4 4s. 7½d. per acre. The balance-sheet below will show the gross returns, and the profit realized from this field.

Items of Interest in the Balance-Sheet.

The balance-sheet has been prepared with a view of showing:—

(1) The net profit which has been made this year from a field of 345 acres of wheat.

(2) The individual profits which have been realized from the three series of operations necessary in the practical harvesting of the field.

The net profit from the 345 acres was £1,222 4s. 7d., or £3 10s. 10¼d. per acre.

Cost of Production of Wheat.

Balance-Sheet.—Season 1915–16.

Date.	*Dr.*	*Cost.*	*Profit.*	*Date.*	*Cr.*	*Value of Produce.*	*Totals.*
	Hay from Headlands.	£ s. d.	£ s. d.			£ s. d.	£ s. d.
22nd June, 1914, to 16th Feb., 1916	Cost of production of 12 acres of hay in stack. (For details see Tables No. 1 and 2	35 7 5		10th Nov., 1915	Valuation of hay in stack—26 tons, at £5 per ton ..	130 0 0	130 0 0
	By credit balance net profit	..	94 12 7	1st Feb., 1916	7,171 bushels of wheat, firsts, at 4s. 9d. per bushel in barn	1,703 2 3	
	Wheat and Straw from Threshing.				683 bushels of wheat, seconds, at 4s. per bushel in barn	136 12 0	
,,	Cost of production of 309 acres of wheat and straw. For details see Tables Nos. 1 and 2	1,355 0 10¾			287 tons of baled straw, net realised	569 1 8	2,408 15 11
	By credit balance net profit	..	1,053 15 0¼	1st Feb., 1916	558¾ bushels of wheat, firsts, at 4s. 9d. per bushel in barn	132 13 8	
	Wheat Harvested by Stripper and Winnowed.				53¼ bushels of wheat, seconds, at 4s. per bushel in barn	10 13 6	143 7 2
,,	Cost of production of 24 acres of wheat. For details see Tables No. 1 and 2 ..	69 10 2¼					
	By credit balance net profit	..	73 16 11¾				
	Total cost of production from 345 acres	1,459 18 6					
	Net profit from the total 345 acres	..	1,222 4 7				
	Total	£2,682 3 1			Total value of produce ..	..	2,682 3 1

This profit was made on the following prices of produce:—

Hay sold for £5 per ton in the stack on 10th November, 1915.
Straw sold for £1 19s. 7¾d. per ton in January, 1916.
Wheat—Firsts, 4s. 9d. per bushel in barn.
Seconds, 4s. per bushel in barn.

The hay and straw both realized prices above the average because of the early market secured, while the wheat was valued at 4s. 9d., and not sold. As it is stud seed, sown and harvested as such, a somewhat increased cost of production was incurred. But, for a purpose of valuation, 4s. 9d. per bushel was taken as the marketable value of this grain as a f.a.q. sample only. If, however, the actual value of the wheat after grading had been reckoned in the balance-sheet, the net profit would have been much greater; but this would be hardly fair from a practical, wheat-growing stand-point.

The individual profits from the three series of harvesting operations actually carried out were:—

1.—*Harvesting the Headlands for Hay.*

		£	s.	d.
12 acres.	Value of hay	130	0	0
	Cost of production ..	35	7	5
	Net profit	94	12	7

A profit of £7 17s. 8½d. per acre was made, which is unusually large, because of the very high price of £5 per ton realized by securing the November market in a year of great scarcity. If, however, the present value be taken, quite a lean margin of profit would be shown.

2.—*Harvesting with the Binder, Threshing, and Straw Pressing.*

		£	s.	d.
309 acres.	Value of wheat and straw ...	2,408	15	11
	Cost of production ...	1,355	0	10¾
	Net profit	1,053	15	0¼

A profit of £3 8s. 2½d. per acre was made, based on f.a.q. wheat, at 4s. 9d., seconds at 4s., and straw at £1 19s. 7¾d. per ton.

3.—*Harvesting by means of the Stripper and Winnower.*

		£	s.	d.
24 acres.	Value of wheat	143	7	2
	Cost of production ...	69	10	2¼
	Net profit	73	16	11¾

A profit of £3 1s. 6½d. per acre was made; with the wheat at f.a.q. value, 4s. 9d.; and seconds at 4s.

A comparison of the above two methods of harvesting a crop of wheat for grain will show that the profit per acre came out in favour of the threshing and pressing by 6s. 8d. per acre. This is, no doubt, due to the ready market obtainable for the pressed straw, and the good price obtained this season at Werribee.

TABLE No. 3.

COST OF SEEDING, WITH AVERAGE MARKET VALUES FOR FEED ON FARM.

Tillage Operation.	Date of Operation.	Value per Ton of Oaten Chaff.	Value per Ton of Oaten and Lucerne Chaff Mixed.	Value per Bushel Crushed Oat Seconds.	Value per Ton Beet Sugar Molasses.	Ration Fed to each Horse per Day Average for Team.	No. of Horses Fed.	Cost of Ration per Horse per Day.	Total Cost of Ration per Day per Team.	No. of Days Fed for Operation.	Total Cost of Horse Feed for Operation.	No. of Days of Labour Paid.	Rate per Day of Labour Paid.	Total Cost of Labour for Operation.	Cost of Oil and Repairs.	10% Depreciation on Value of Implements.	10% Depreciation on Value of Horses.	5% Interest on Value of Horses.	5% Interest on Value of Implements.	Total No. of Acres Cultivated.	No. of Acres per Day per Implement Cultivated.	Cost per Acre of each Operation.	Total Cost of each Operation.
		s. d.	s. d.	s. d.	s. d.			s. d.	s. d.	s. d.	£ s. d.		s. d.	£ s. d.	s. d.	s. d.	s. d.	s. d.	s. d.			s. d.	£ s. d.
Ploughing..	1914. 26th June 18th Aug.	55 0	..	1 9	..	Oaten chaff, 38 lbs. Oats, seconds, 7 lb.	12	1 3	15 0	54	40 10 0	92	8 0	36 16 0	70 0	13 9	138 0	69 0	6 10½	345	3¾	5 4	92 3 7½
Double harrowing	19th Aug. 3rd Sept.	55 0	..	1 9	..	" "	12	1 3	15 0	16	12 0 0	26	8 0	10 8 0	12 6	2 0	35 0	17 6	1 0	345	26½	0 9	25 10 0
Harrowing..	24th Sept. 11th Oct.	..	60 0	1 9	30 0	Oaten and lucerne chaff mixed, 31 lbs. Oats, seconds, 2½ lbs. Beet molasses, 2 lbs.	6	0 11½	5 9	18	5 3 6	10 4	8 0 7 0	5 8 0	6 6	1 2	19 8	9 10	0 7	345	24½	0 8¾	12 9 3
Harrowing..	28th Nov. 12th Dec.	..	60 0	1 9	30 0	" "	6	0 11½	5 9	15	4 6 3	13	7 0	4 11 0	6 2	1 0	16 5	8 2¼	0 6	345	26½	7½	10 9 6¾
Spike rolling and harrowing	29th Dec. 1915. 26th Jan.	..	60 0	1 9	30 0	" "	6	0 11½	5 9	30	8 12 6	26	7 0	9 2 0	15 0	4 11	32 10	16 5	2 5½	345	13¼	1 2¾	21 6 1½
Cultivation, 3½" deep	26th Jan. 27th Feb.	..	60 0	1 9	30 0	" "	5	0 11½	4 9½	49	11 14 9½	44	7 0	15 8 0	22 0	10 9	45 8	22 10	5 4½	345	7½	1 10½	32 9 5
Harrowing before drilling	17th April 3rd May	..	60 0	1 9	30 0	" "	6	0 11½	5 9	18	5 3 6	15	7 0	5 5 0	6 6	1 2	19 8	9 10	0 7	345	23	8½	12 6 3
Drilling ..	20th April 3rd May	..	60 0	1 9	30 0	" "	8	0 11½	7 8	13½	5 3 6	23	7 0	8 1 0	9 0	6 1	20 8	10 4	3 0½	345	15	11	15 13 7½
Harrowing after drilling	17th April 3rd May	..	60 0	1 9	30 0	" "	6	0 11½	5 9	18	5 3 6	15	7 0	5 5 0	6 6	1 2	19 8	9 10	0 7	345	23	8½	12 6 3
Seeding ..	17th April 3rd May	Total graded seed wheat sown, 356½ bushels, at 5s. 6d. = 62 lbs. per acre. Cost per acre and total cost of seed wheat																				5 8¼	98 0 9
Manuring ..	17th April 3rd May	Total superphosphate, 36–38 % sol. sown, 16½ tons, at £45 per ton = 107 lbs. per acre. Cost per acre and total cost of manure ..																				4 0¾	70 2 6
		Rent on land, 12s. per acre, for eighteen months. Total cost per acre, £1 3s. 4½d. Total cost, 345 acres to date .. .. To be added after harvest = £207 + £4 11s. 6d., temporary improvements.																					403 3 4

TABLE No. 4.

COST OF HARVESTING UNDER NORMAL CONDITIONS.

Harvesting Operations.	No. of Horses Worked.	No. of Days Worked.	Cost of Horses for each Operation.	No. of Men.	No. of Days of Labor Paid.	Rate of Pay per Day.	Cost of Labor for Operation.	Cost of Binder Twine.	Cost of Oil and Repairs.	Depreciation and Interest on Implements.	No. of Acres of each Operation.	Cost per Acre of each Operation.	Total Cash of each Operation.	Total Cash of Harvesting Produce.
			2s. per day. £ s. d.			s. d.	£ s. d.	12 balls. £ s. d.	£ s. d.	£ s. d.		s. d.	£ s. d.	£ s. d.
Headlands, cut for Hay	3	2	0 12 0	1	2	9 0	0 18 0	1 5 0	0 5 0	0 10 0	12	5 10	3 10 0	..
Stooking, carting, and stacking hay	4	3	1 4 0	2	10	9 0	4 10 0	..	..	0 5 0	12	9 11	5 19 0	9 9 0
Cutting crop for threshing	12	15	18 0 0	2	30	10 0	15 0 0	16 balls 20 8 6	3 15 0	7 10 0	309	4 2¼	64 13 6	..
Stooking, carting, and stacking	12	12½	15 0 0	20	250	16 @ 9s. 4 @ 10s.	115 0 0	..	..	6 5 0	309	8 9	130 5 0	..
Threshing and stacking straw	..	Contract work, 2,390 bags of firsts, at £3 5s. per 100 bags,						Total cost	..	..	..	..	77 13 6	..
Carting wheat to store	15	9	13 10 0	4	36	7 6	13 10 0	..	..	3 7 6	309	2 0	30 17 6	..
Pressing straw ..		Contract work, 287 tons of straw at 12s. per ton.						Total cost	..	..	..	..	172 4 0	..
Carting straw to station	10	16	16 0 0	2	32	7 6	12 0 0	..	..	4 0 0	309	2 0¾	32 0 0	..
Loading straw on trucks		Contract work at 2s. per truck ..				..	Total cost	..	..	..	..	..	4 16 9	..
Cost of sacks and sewing twine	..	2,617 standard sacks at 7s. per dozen, £76 6s. 7d.; sewing twine, £1 10s.								..	Total	..	77 16 7	596 6 10
Stripping	3	4	1 4 0	1	4	0 10 0	2 0 0	..	0 6 6	0 12 0	24	3 5	4 2 0	..
Winnowing	..	..	..	2	4	0 9 0	3 12 0	..	0 2 0	0 8 0	24	3 5	4 2 0	..
Carting wheat to store	15	½	1 2 6	4	3	0 7 6	1 2 6	..	..	0 3 9	24	2 0½	2 8 9	..
Cost of sacks and sewing twine	..	204 standard sacks, at 7s. per dozen, £5 19s.; sewing twine, 2s. 6d.							..	..	..	..	6 1 6	14 14 3
		Temporary improvements, £4 11s. 6d.; rent on land £207								..	..	..	211 11 6	211 11 6
		Grand Total Cost of Harvesting under normal conditions									..	..	..	832 1 7

Cost of Production of Wheat.

Balance-Sheet for Normal Conditions.

Dr.	*Cost.*	*Profit.*	*Cr.*	*Value of Produce.*	*Totals.*
Hay from Headlands.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
Cost of production of hay in stack under normal conditions. (For details see Tables No. 3 and 4)	30 16 7½		Valuation of hay in stack under normal conditions in November—26 tons at £2 5s. per ton	58 10 0	58 10 0
By credit balance net profit ..	..	27 13 4½			
Wheat and Straw from Threshing.			*Normal Valuations of Wheat and Baled Straw.*		
Cost of production of 309 acres of wheat and straw under normal conditions. (For details see Tables No. 3 and 4) ..	1,140 18 9½		7,171 bushels of wheat, firsts, at 3s. 4d. per bushel	1,195 3 4	
By credit balance net profit ..	..	641 7 9½	683 bushels of wheat, seconds, at 2s. 9d. per bushel	93 18 3	
			287 tons of straw, baled, on trucks at Werribee, at 35s. per ton	502 5 0	1,791 6 7
Wheat Harvested by Stripper and Winnowed.			*Normal Values of Wheat on Farm.*		
Cost of production of 24 acres of wheat under normal conditions. (For details see Tables No. 3 and 4)	57 9 6		558¾ bushels of wheat, firsts, at 3s. 4d. per bushel	93 2 3	
By credit balance net profit ..	..	42 19 5	53¼ bushels of wheat, seconds, at 2s. 9d. per bushel	7 6 8	100 8 11
Total cost of production from 345 acres normally	1,235 4 11				
Net profit procurable from 345 acres normally	..	715 0 7			
Total	£1,950 5 6		Total value of produce ..	..	1,950 5 6

Tables 3 and 4 and balance-sheet set out the cost and the returns from this field with commodities at their normal level of values.

The seeding of this paddock was carried out at a time when horse-feed was at famine prices, and at harvest the prices both of fodder and straw were considerably beyond normal values. Consequently the tables have been drawn to show what would be the cost of production under average conditions.

The cost of horses has been allowed for at 2s. per day, which is the normal cost of maintaining a working horse at the farm, and allowing for depreciation, interest on outlay, and idle days.

Labour has been charged at the current rates prevailing in the district, namely, 7s. to 8s. per day at seed-time, and 9s. to 10s. per day at harvest.

Standard cornsacks and binder twine have been reckoned at the average price ruling for the past few years.

Wheat has been taken at its normal value, namely, 3s. 4d. per bushel for f.a.q. quality and 2s. 9d. per bushel for seconds.

The past season, on which these returns have been based, although a yield of 27 bushels per acre was realized, cannot be considered exceptionally good, because of the fact that the rainfall for the whole year was 15.55 inches, or 5 inches below the average; and the fall during the growing period of the crop, namely, May to November, was 10.84 inches, as compared with the average fall during the same period for 42 years of 12.10 inches.

It will be seen that a wheat farmer who exercises ordinary care and economy and who attends consistently to the thorough cultivation of his soil, liberal manuring of the crop, and judicious selection of his seed, can assure himself of a good return on his capital and industry in a normal season.

AGRICULTURAL ITEMS.

Influenza, a catarrhal disease, affects horses from time to time. It is known as pink eye on the American continent. It is generally deemed an infectious ailment, but is as erratic in its departure as it is sudden in its intrusion into a stud.

Fighting sheep are kept by the native princes in India. These rams are generally white, with a trace of brown on the head and feet. The nose is arched and the horns large and massive, projecting in spiral form about the head. The tail measures about 4 inches in length.

The more systematically either arable or pasture land is ridged and furrowed, the more rapid is the process of weathering, and the larger the quantity of food made and liberated for the use of plants; hence the soil maker has to adopt methods of draining and soaking the sub-material to a greater depth than takes place under natural conditions.

The shape of the udder is a valuable indication of milking capacity when considered in conjunction with manual examination. The fleshy vessel is soon discovered, and where the fleshiness is pronounced it almost certainly indicates lack of milking qualities. The vessel that has a good "fall" and is level rather than pendulous is the type of udder that dairymen like.

Deep-rooting crops are soil factors of the highest value, and many weeds, notably thistles, mallows, and other subjects, which make piped roots and cavities in the soil, are by no means a misfortune where soil is at all shallow, or excessively heated and dry in summer. In many quarters, the roots of weeds will be found to be the only disrupting and deepening soil factors.

Good farmers improve their land, bad farmers impoverish it. The man who makes soil, makes money, and he who increases his banking account at the expense of his farm is a false economist. The soil is ever the medium, and if it can be made a safe medium of profit for a thousand years, it will return an infinitely higher reward than where a "take-all" or exploitation policy is pursued.

Probably the best sweetener of pasture-land is lime. In one form or another lime checks acidity, develops sweetness, and brings back much clover whose presence may not be suspected. Foggy pastures benefit greatly by liming. The methods of applying lime are many. There is the ordinary ground lime, which is often difficult to get locally. Limestone ground is very useful, and experiments have shown that it is little inferior to the burnt stone. Then in basic slag there is a certain element of lime, which accounts for slagging largely superseding the old practice of liming.

The manure pit should be planned on a tonnage basis, since, according to the class of land and kind of farm to be worked, it will demand a definite quantity of bulk manure per acre. Under ordinary conditions of feeding and housing, pigs yield more manure than any other animal, but the manure supply of the farm depends, not so much on the number of animals raised, as the care and provision made in accumulating and conserving it. It is to this neglect of our homestead manure supply that we must attribute so many depleted areas, which, under more intelligent management, would have improved rather than declined in value

The roots of crops, manure of any kind, old surface soil, water, and air are the true soil-making factors, and when these penetrate to the subsoil, or the subsoil is mixed through them, then the true "weathering" takes place, and more soil is made. To work poor and bare soil to any depth is, therefore, of little or no value. Let us say that it is always wrong to plough a bare fallow, in so far as we desire to make more soil, since no addition is made, and little or no change of importance takes place in the soil. It is looser, sweeter, and more acceptable to a given crop, but an exhaustive process all the same, whereas every crop should compensate in some form or other for what it takes from the soil.—*Auckland Weekly Times.*

WHAT SHALL WE DO WITH OUR LUCERNE?

R. T. Archer, Senior Dairy Inspector.

In discussing means of obtaining satisfactory returns for lucerne on irrigation settlements, the impression appears abroad that the present price of dairy cows is prohibitive. If that were so, how could the British farmer afford to conduct a dairy farm at all, for the regular price for a dairy stock there is always about equal to the prices ruling here this season. As will be seen from the table given below, the dairy farmer in England does not receive higher rates for produce of good quality on an average than the farmer in this country, be it milk, butter, or cheese. Also our herd testing experience leads us to the opinion that our cattle are capable of as good returns as those of Britain or other countries when well fed. That is where the difference lies. In Britain the cows are well fed the year round. Here they generally have sufficient feed while there is abundance of spring grass, but as soon as that becomes short or dry, and as substitutes or supplementary feeds are not provided, the cows dry off, consequently the returns are profitable for five or six months only. Dairy cows have now arrived at a fair valuation, and it should be an inducement to those farmers who own them to pay more attention to improvement in breeding and management. In the past, it has been generally conceded that £7 10s. per annum would cover the cost of keeping a cow, including food, interest, labour, &c. To this must now be added interest and sinking fund on increased cost of purchase, which will probably be £15. Allowing 5 per cent. interest = 15s., and 20 per cent. sinking fund = £3, making annual cost £11 5s. A herd of such cows would easily average 300 lbs. of fat, which at 1s. would return £15. Skim milk would amount to about 5,400 lbs. As 30 lbs. of skim milk will produce 1 lb. of pork, there would be 180 lbs. of pork per cow, valuing this at 6d. would give £4 10s. (present and probable future price for some years will be 50 per cent. above that). At this rate the total gross return per cow would be £19 10s., or net £8 5s., besides the calf. One acre of lucerne should provide sufficient feed for a cow for a year (*i.e.*, 5 cuts of 1 ton of hay each, equal to 3 tons green stuff, or 15 tons for the year of green lucerne); that would give a return equal to £19 per acre for lucerne converted into milk.

With regard to heifers, it has been found to cost at least £6 per head to rear to two years old, when they will usually drop their first calf, but very rarely could anything like that amount be obtained for them, so that instead of showing a profit they were sold at an absolute loss, consequently there was no inducement to rear. Now these heifers will bring £12 to £15 per head, and so will pay well to rear. I notice in the *Age*, of 1st March, a statement by the Hon. the Minister of Water Supply, to the effect that a farmer at Cohuna realized an average return per cow of £19 per head, so the foregoing is not an exaggeration. Cheese makers in the Western District have for years past made somewhere about that figure.

In conjunction with the dairy, for satisfactory results, the pig is almost indispensable, and while 30 lbs. of skim milk will produce 1 lb. of pork, when combined with grain feed or mill offal the return is enormously increased. The addition of lucerne chaff, or better still lucerne meal as produced by the Kelly Duplex, or similar mill, is also very beneficial from an economic point of view. When lucerne is ground into meal it is practically equal to pollard or other meal pound for pound. It is found that 40 lbs. of green or 15 lbs. of dry lucerne will produce 1 lb. of pork. So that one acre of green lucerne, equal to 15 tons, should produce 840 lbs. of pork. This at 6d. per lb. is equal to £21. When the pig industry has developed, however, we shall have to depend upon export values, which are ruled by the London market, so that we should reckon on about 4d. per lb., which would work out at about £14 per acre. Of course, it must not be assumed that this return will be obtained by feeding lucerne alone, but in conjunction with other food, such as skim milk and grain. It has been found that lucerne, like clover, has an increased value through being rich comparatively in mineral matter, such as phosphate of lime, especially in the case of young animals, as growing pigs. A plentiful supply of phosphate of lime whether in the food naturally or added in the form of bone meal, reduces the cost of production very considerably, by enabling the animals to digest and assimilate a bigger percentage of the food they consume.

It must not be expected that these good results are likely to be obtained by novices, but they can be and are being obtained by those who understand the management of stock. The high prices now ruling should increase the interest in herd testing, for a dairyman would be safer in paying a good price for a cow that, by the test, has proved a good producer. Very frequently the finest looking cow is absolutely unprofitable when her capacity for production is ascertained.

It must ever be borne in mind that a cow must have all she can eat if she is to produce her maximum, and that then it takes about 60 per cent. of the food she eats to keep the body going, and it is only what she eats in excess of her bodily requirements that she can convert into milk. A very large number of cows in this country are unprofiable only because they do not receive sufficient feed.

The most primitive form of farming is to grow crops for sale to other people, who buy them to feed to stock for the purpose of making profit, which the grower might as easily obtain. Besides by feeding for the production of milk or meat, the crop is concentrated to from ⅛ to $\frac{1}{10}$ the weight, thereby saving considerably in freight. Another point that is all important, but lost sight of, is that when selling the crop for

consumption off the farm the fertility of the soil is being continually depleted, also the mechanical condition is detrimentally affected through the decrease in the amount of organic matter or humus in the soil. Either animals' droppings or the systematic ploughing in of green crops appears to be the only practicable means of keeping this up to the normal.

Comparative Price of Stock, Feed, and Produce.

ENGLAND.	VICTORIA.
Week ending 5th January, 1916.	Week ending 8th January, 1916.
MIDWINTER.	MIDSUMMER.
COWS.	COWS.
First grade springers, £26 to £32. First grade springers in milk, with calf at foot, £26 10s. to £34 10s.	Springers (15th January), £12 to £26.
VEAL.	VEAL.
10¼d. per lb.	6¾d. per lb.
PIGS.	PIGS.
Pork (carcass, first quality), 10d. per lb. Bacon (first quality), 9d. per lb. Lard, 7⅛d. per lb.	Pork (carcass, first quality), 1s. per lb. Bacon (first quality), 1s. 2d. per lb. Lard, 10½d. per lb. Porkers, 45s. to 83s. Small light baconers, 84s. Prime heavy, £5 8s. Choice farmers' lots, £5 8s.
BUTTER.	BUTTER.
Superfine, 1s. 8d.	Superfine, 1s. 1d.
CHEESE.	CHEESE.
Finest Cheddar (matured), 11¼d.	Finest Cheddar, 1s. 4d. per lb. Semi-matured, 1s. 1d. per lb.
MILK.	MILK.
13½d. per Imperial gallon.	1s. per Imperial gallon.
STOCK FEED.	STOCK FEED.
Meadow Hay, average £6 per ton, 2,240 lbs. Clover Hay, £7 4s. Bran, £8 per 2,000 lbs. Pollard, £8 per 2,000 lbs. Barley, 5s. per 50 lbs. Oats, 4s. 2d. per 40 lbs. Oat hulls, £5 10s. per 2,240 lbs. Swede turnips, 25s. Rice meal, £9 5s. per 2,240 lbs.	Oaten Hay, £3 10s. Lucerne Hay, £3 10s. Bran, £4 5s. per 2,000 lbs. Pollard, £6 10s. per 2,000 lbs. Barley, 2s. 2d. per 50 lbs. Oats, 2s. 2d. per 40 lbs.

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commenced 15th April, 1915; concluded 14th April, 1916.

FINAL RESULTS.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE.

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.3.16	15.3.16 to 14.4.16	Twelve months.	Position in Competition.
		LIGHT BREEDS.				
		Wet Mash.				
38	White Leghorns ..	G. McDonnell	1,557	104	1,661	1
34	" ..	H. McKenzie and Son ..	1,524	113	1,637	2
42	" ..	W. M. Bayles	1,505	118	1,623	3
23	" ..	Fulham Park	1,417	125	1,542	4
59	" ..	W. G. Osburne	1,408	126	1,534	5
5	" ..	J. J. West	1,412	112	1,524	6
8	" ..	C. J. Jackson	1,425	91	1,516	7
2	" ..	E. A. Lawson	1,451	42	1,493	8
54	" ..	W. H. Clingin	1,379	104	1,483	9
30	" ..	A. E. Silbereisen ..	1,388	81	1,469	10
19	" ..	L. G. Broadbent ..	1,439	28	1,467	11
3	" ..	J. H. Gill	1,363	103	1,466	12
28	" ..	R. Lethbridge	1,380	82	1,462	13
16	" ..	N. Burston	1,350	91	1,441	14
60	" ..	John Hood	1,337	100	1,437	15
44	" ..	Mrs. F. M. Oliver ..	1,316	107	1,423	16
39	" ..	W. M. Sewell	1,332	82	1,414	17
6	" ..	F. Doldissen .. .	1,317	96	1,413	18
58	" ..	Thirkell and Smith ..	1,312	99	1,411	19
18	" ..	D. Adams	1,319	88	1,407	20
27	" ..	J. A. Stahl	1,308	99	1,407	20
9	" ..	J. Schwabb	1,313	82	1,395	22
32	" ..	F. Hodges	1,285	108	1,393	23
22	" ..	S. Buscumb	1,286	106	1,392	24
7	" ..	Marville Poultry Farm ..	1,356	29	1,385	25
11	" ..	J. B. Brigden	1,313	67	1,380	26
4	" (5 birds)	R. Hay	1,287	83	1,370	27
26	" ..	A. Mowatt	1,287	81	1,368	28
13	" ..	T. Hustler	1,282	76	1,358	29
20	" ..	R. W. Pope	1,285	71	1,356	30
10	" (5 birds)	A. E. Tuttleby	1,273	81	1,354	31
43	" ..	H. I. Merrick	1,268	82	1,350	32
15	" ..	H. N. H. Mirams ..	1,278	71	1,349	33
21	" (5 birds)	E. B. Harris	1,308	10	1,318	34
1	" ..	Mrs. H. Stevenson ..	1,267	47	1,314	35
24	" ..	Lysbeth Poultry Farm ..	1,252	61	1,313	36
55	" ..	W. N. O'Mullane ..	1,212	101	1,313	36
46	" ..	R. Berry	1,188	107	1,295	38
33	" (4 birds)	A. W. Hall	1,224	68	1,292	39
12	" ..	G. Heyman	1,191	93	1,284	40
60	" ..	B. C. Brock	1,205	76	1,281	41
41	" ..	J. A. Donaldson ..	1,193	80	1,273	42
36	" ..	Weldon Poultry Yards ..	1,221	51	1,272	43
49	" (5 birds)	Bennett and Chapman ..	1,229	16	1,245	44
40	" ..	C. C. Dunn	1,146	88	1,234	45
48	" ..	C. J. Beatty	1,180	44	1,224	46
52	" ..	A. A. Sandland	1,156	62	1,218	47
37	" ..	A. Ross	1,132	84	1,216	48
53	" (5 birds)	W. G. Swift	1,172	34	1,206	49
45	" ..	South Yan Yean Poultry Farm	1,110	85	1,195	50
25	" (5 birds)	Giddy and Son	1,166	24	1,190	51
47	" ..	J. C. Armstrong ..	1,142	27	1,169	52
57	" ..	R. Mitchell	1,075	63	1,138	53
14	" (5 birds)	W. Flood	1,073	45	1,118	54
31	" ..	L. McLean	1,053	15	1,068	55
56	" (5 birds)	C. Hurst	985	59	1,044	56
		Total	71,632	4,268	75,900	

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915–16—*continued.*

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.3.16	Totals. 15.3.16 to 14.4.16	Totals. Twelve months.	Position in Competition.
		LIGHT BREEDS.				
		DRY MASH.				
80	White Leghorns ..	W. H. Robbins	1,541	97	1,638	1
68	.. ..	H. McKenzie and Son ..	1,490	111	1,601	2
76	.. ..	A. A. Sandland	1,364	93	1,457	3
63	.. ..	A. H. Padman	1,355	90	1,445	4
79	.. ..	Lysbeth Poultry Farm ..	1,363	65	1,428	5
61	.. ..	Mrs. H. Stevenson ..	1,262	112	1,374	6
67	.. ..	C. C. Dunn	1,287	79	1,366	7
65	.. ..	Thirkell and Smith ..	1,267	88	1,355	8
62	.. ..	Benwerren Egg Farm ..	1,308	35	1,343	9
66	.. ..	E. A. Lawson	1,263	49	1,312	10
69	.. ..	E. MacBrown	1,264	41	1,305	11
72	.. ..	Mrs. E. Zimmerman ..	1,244	55	1,299	12
71	.. ..	Moritz Bros.	1,239	41	1,280	13
78	.. ..	H. Hanbury	1,203	74	1,277	14
73	.. ..	C. L. Lindrea	1,165	105	1,270	15
77	.. ..	South Yan Yean Poultry Farm	1,149	93	1,242	16
64	.. (2 birds)	W. M. Bayles	1,150	40	1,190	17
74	.. (5 birds)	J. H. Gill	970	43	1,013	18
75	.. ..	Fulham Park	937	32	969	19
		Total	23,821	1,343	25,164	
		HEAVY BREEDS.				
		WET MASH.				
86	Black Orpingtons ..	C. E. Graham	1,419	88	1,507	1
97	,, ..	Marville Poultry Farm ..	1,358	89	1,447	2
89	Rhode Island Reds	E. W. Hippe	1,308	115	1,423	3
85	Black Orpingtons ..	H. H. Pump	1,291	103	1,394	4
92	,, ..	J. Ogden	1,302	75	1,377	5
81	,, ..	Mrs. T. W. Pearce ..	1,275	88	1,363	6
93	,, (5 birds)	L. W. Parker	1,225	71	1,296	7
88	,, ..	J. McAllan	1,171	91	1,262	8
98	Faverolles ..	K. Courtenay	1,138	108	1,246	9
100	Black Orpingtons (5 birds)	J. H. Wright	1,179	48	1,227	10
87	,, ..	W. O. Spencer	1,152	53	1,205	11
84	,, ..	Cowan Bros.	1,161	41	1,202	12
90	,, (5 birds)	Oaklands Poultry Farm ..	1,125	64	1,189	13
91	,, ..	A. Greenhalgh	1,145	22	1,167	14
99	,, ..	L. McLean	1,136	36	1,172	15
95	Silver Wyandottes ..	W. H. Forsyth	1,046	63	1,109	16
83	Black Orpingtons ..	G. Mayberry	953	31	984	17
94	Black Orpingtons (5 birds)	D. Fisher	966	12	978	18
82	White Wyandottes (5 birds)	J. B. Brigden	756	64	820	19
96	White Orpingtons ..	Stranks Bros.	654	33	687	20
		Total	22,760	1,295	24,055	

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

INSECT PESTS OF THE FRUIT, FLOWER, AND VEGETABLE GARDEN.

AND HOW TO TREAT THEM.

By C. French, Jnr., Government Entomologist.

(Continued from page 218.)

The Green Peach Aphis.

This is larger than the black peach aphis. It appears later in the season, and attacks the shoots and leaves. The leaves are frequently blistered, so that they look as if distorted by the peach curl fungus. In these blisters dozens of the aphides may be seen in different forms. Like most of the insects of the same order, it breeds very rapidly; so that there are a number of broods before midsummer, at which time the survivors go underground and fasten on to the roots. The females of the black peach aphis deposit their eggs—which are small, oval, and of a shiny black colour—in the crevices of the tree, behind the buds, &c. While the trees are dormant, spray with lime and sulphur wash, or red oil. Quassia chips are frequently used with beneficial results. When the leaves are on the trees, spray with tobacco water, which is made as follows:—Steep 1 lb. tobacco in 1 gallon of hot water, and allow it to soak for 24 hours. Boil 1 lb. of soap in 1 gallon of water until the soap is dissolved; strain the tobacco water into the soap water; stir well, and make up to 5 or 6 gallons. Use waste stems of tobacco.

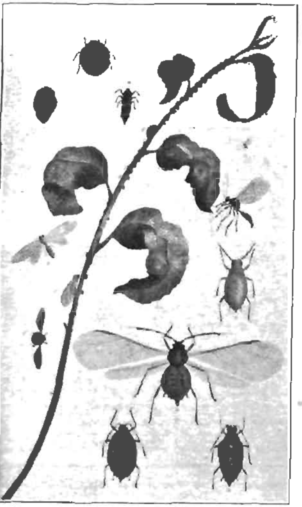


Fig. 6.—Green Peach Aphis (*Myzus*, Sp.).

The Cherry Green Beetle.

This is a beautiful green beetle, about one-third of an inch in length. It is a native of Victoria, and formerly fed on the leaves of the various ti- or tea trees at Caulfield, Warburton, Cheltenham, and other locali-

ties near Melbourne. It appears about November, and is often to be found in millions swarming over the trees attacked. Unfortunately, during the last few years, it has forsaken its native food, and is doing great damage to all kinds of fruit and garden plants, roses especially being destroyed. Not only are the young buds destroyed, but the epidermis is completely eaten off the leaves; rose bushes then look

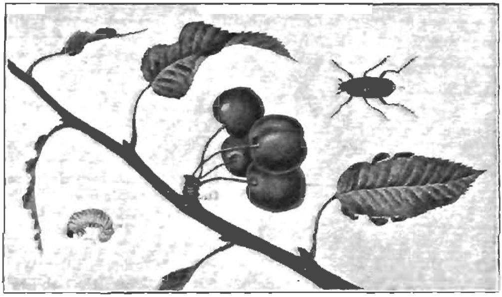


Fig. 7.—The Cherry Green Beetle (*Diphucephala colaspidoides*, Gyll.).

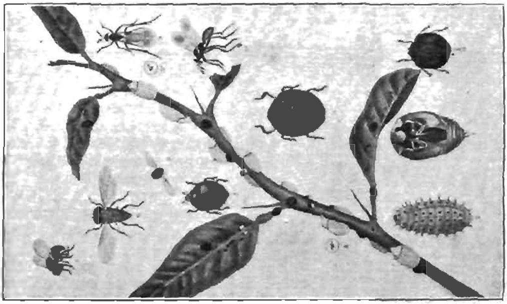


Fig. 8.—The Cottony-cushion Scale (*Icerya Purchasi*, Maskell).

as if a fire had scorched them. During the past season, these insects have been playing havoc with cherries, peaches, raspberries, and other small fruits. Sometimes they occur in countless numbers in cherry orchards near Melbourne, and are blown out to sea by the north winds, and drowned. Large numbers are found on the foreshores around the

Bay washed up by the waves. When they appear in a garden, smudge fires should be tried. Spray trees with arsenate of lead before the fruit ripens.

THE COTTONY-CUSHION SCALE.

This is a well-known pest on orange, lemon, acacia (wattles), pittosporum and other trees, also many garden plants. The fully-matured females are easily distinguished by the large, white, fluted, cottony egg masses at the posterior end of the red, yellow, or dark-brown bodies—which together are from ¼ to ½ in. long, and three-fourths as wide. The eggs are deposited within the cottony masses, and are oblong, and a rich cardinal red. From 400 to 1,000 may be laid by a single female. The young are bright red. The males are small, two-winged, red-bodied insects, with long antennæ. The large cottony masses are the egg-sacs of the females. The majority of the members of the (Coccidæ) "Scale Insects" have the ability to produce a scale-like covering, from which the common name is derived; while some, unable to form a scale, have the epidermis hardened into a thick, hard, chitinous wall; and still others secrete an abundance of white, powdery, or cotton-like wax as a covering. They feed by inserting into the tissues of the plants their small beaks or mouth parts, and sucking the juices. As a consequence of their great numbers, and the removal of a large amount of juices, the plants become weakened.

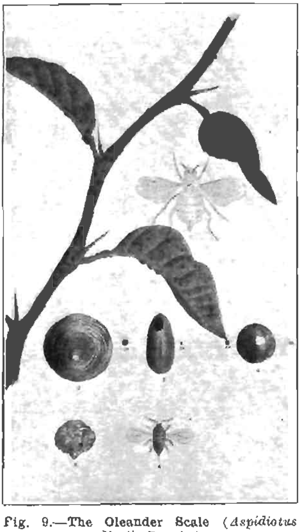


Fig. 9.—The Oleander Scale (*Aspidiotus Nerii*, Bouche).

This scale was at one time one of the worst insect pests of citrus trees in California; but, through the introduction of our Australian ladybird beetles into California, they have practically wiped the scales out. In Victoria, the red oil, lime and sulphur, and kesosene emulsion sprays are used against these insects.

THE OLEANDER OR IVY SCALE.

This species is rather a common greenhouse and garden pest, and not infrequently it causes considerable damage to palms, ivy, orchids, aspidistrias, and many other plants, fruit trees, and shrubs. Plants

attacked by this scale may be recognised by the yellowish-white, irregular patches of scale insects. The conditions in the greenhouse usually permit this insect to breed continuously, so that there is no demarcation of broods. Adult females, half-grown individuals, and crawling young can usually be found at almost any time. This pest is an introduction from Europe, where its attacks on garden plants are very severe. In some gardens this scale is destroyed by small wasps. During the last few years, the red oil sprays have been used for scale insects of all kinds, and the results have been most satisfactory. For deciduous fruit trees, apples, pears, &c., in winter, when buds are dormant, spray with red oil, 1 in 20; or in spring, when the buds are bursting, use 1 in 30. For ornamental trees and plants, spray in winter, when buds are dormant, 1 in 20. For palms, for scale insects, spray during spring or autumn. Plants growing outdoor, 1 in 30; in the greenhouse, spray on bright day with this spray, 1 in 40. Lime and sulphur is also used as a winter spray for scale insects.

(To be continued.)

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

CULTIVATION.

Cultivation work should be well on the way by this time. The ploughing should be advanced, so as to leave plenty of time for other orchard work. The autumn ploughing may be as rough as possible, taking care to plough to the trees, so that the drainage furrow is left between the rows.

MANURING.

It is just possible, where heavy crops have been carried, that a top dressing of stable manure will be required to add humus to the soil. The fertility of the soil must be maintained; and, although stable and chemical manures as a general rule are of undoubted value as tree stimulants, well-cultivated and thoroughly tilled land will always carry fair crops, and with far less manure than otherwise. Also, if the orchard land is well and thoroughly drained, cultivated, and sub-soiled, any manures that are used will be far more beneficial to the trees. The more suitable conditions that are given to the trees, the better they can appreciate and assimilate their food.

Perhaps the most useful and valuable of manures is stable manure. It is of great use, not only as a manure and as an introducer of necessary bacteria into the soil, but its value in adding humus to the soil is

incalculable. Organic matter, such as stable manure, introduced into the soil quickly becomes humus; this greatly ameliorates and improves soil conditions. It is impossible to say what quantity of stable manure is necessary per acre; that alone can be determined by each circumstance. Orchards in different climates and in different soils will require differing quantities. A too liberal use of stable manure will be over-stimulating in most cases; while an excess beyond what is necessary for present use will only be waste, as humus is readily lost from the soil, once it is in an available food form.

It has been pointed out in these notes previously that an improved physical condition is far more profitable to the fruit-grower than the continued use of manures. A tree will be far more productive if it is happy in its soil conditions; uncomfortable conditions will always result in unprosperous trees.

A dressing of lime, using about 4 or 5 cwt. per acre, is of great value in stiff or heavy orchard lands; and it may be given at this season. The lime, which must be fresh, should be distributed in small heaps between the trees, covered with a layer of soil, and allowed to remain for a few days before ploughing or harrowing in.

Pests.

The advice given last month for spraying should be followed, particularly where any oil emulsions or washes are to be used.

Orchards will benefit if an attack is now made upon the Codlin moth. All hiding places, nooks, and crannies, where the larvæ have hidden, should be thoroughly searched and cleaned out. The orchardist has far more time now to do this work than he will have in the spring time.

General Work.

Drainage systems should now be extended with as little loss of time as possible.

New planting areas should be prepared, and subsoiled or trenched wherever possible.

The Vegetable Garden.

Weeds must be kept down in the vegetable garden. Weeds are generally free growing at this season; their growth is very insidious, and they will crowd out the young seedlings or plants in a very quick time. Hoeing and hand weeding must be resorted to, preferably hoeing. The frequent use of the hoe in winter time is of much benefit in the vegetable garden. A varied assortment of crops is now being produced; and if these can be kept growing much better crops will result. The soil quickly stagnates in the winter, and the only way to prevent this is to keep the surface stirred. Thus, a double service is performed with the aid of the hoe.

The application of lime is of great necessity at this season. In addition to amending unhealthy and unsuitable soil conditions, lime is particularly useful as an insecticide. It assists in destroying both eggs and insects in immense numbers, that would breed and live in the ground ready to do damage to all classes of vegetable crops. Therefore, wherever possible, the soil should receive an application of lime. The

garden should, as well, be manured with stable manure, but not for some weeks after the lime application.

Cabbage and cauliflower plants may be planted out; and seeds of parsnips, carrots, onions, peas, and broad beans may be sown.

The Flower Garden.

The whole flower section should now be thoroughly dug over. All beds should be cleaned up, top-dressed with manure, and well dug. The light rubbish, such as foliage, twiggy growths, weeds, &c., may all be dug in, and they will thus form a useful addition to the soil. These should never be wasted. Only the coarser and stouter growths should be carted away for burning, and then the ashes may be used as manure. No part, whatever, of garden rubbish or litter need be wasted. In one form or another it should be replaced in the soil.

May is a good month for establishing new gardens, and for planting out. All deciduous plants and shrubs may now be planted. It is not necessary to dig a deep hole for planting. A hole in which the roots of the plant can be comfortably arranged, without crowding or cramping, will be quite sufficient for the purpose.

Continue to sow seeds of hardy annuals, including sweet peas, although the main crop of sweet peas should be well above ground. Where there has been any overplanting, the young plants will readily stand transplanting, and this will greatly assist those that are to remain. Annuals should not be crowded in the beds. They require ample room for suitable development, and thus the seeds should be sown thinly or the plants set out a good distance from each other.

All herbaceous perennials that have finished blooming may now be cut down. Included amongst these are phlox, delphiniums, &c. If these are to remain in their present situation for another season it is always an advantage to raise them somewhat, by slightly lifting them with a fork, so that too much water will not settle around the crowns; they may also be mulched with stable manure, or the manure may be forked into the soil around the crowns.

REMINDERS FOR JUNE.

LIVE STOCK.

HORSES.—Those stabled and in regular work should be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley. Paddocked horses should be looked at from time to time to ascertain if they are doing satisfactorily.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. If in low condition feed well to tide them over the period and stimulate milk flow. Calves should be kept in warm dry shed. Cows and heifers for early autumn calving may be put to the bull.

SHEEP.—Clear muck-balls from tails and legs of all sheep. Have the wool cleared from round udders and eyes of all young lambing ewes, and see them first thing every morning. Mark the ram lambs at earliest chance. Cut off ewes with oldest wether lambs to best pasture or fodder crops.

Sheep with overgrown hoofs are unthrifty. Whenever noticed trim back into shape; they cut easily during winter. If left, are conducive to lameness, and even foot rot. In the case of common foot rot, or scald, the feet can be placed into a thick paste made of lime and boiling water. Obstinate cases of long standing may need more drastic remedies, and persistent attention. In all cases pare away all loose portions, and leave the diseased parts clearly exposed.

Foxes are more ravenous during winter months. Sparrows, starlings, and parrots are good bait. Poisoning lambs already killed usually accounts for scavenger foxes only, and in many cases innocent good dogs.

Every fox is not a lamb killer. Remove all lambs for two or three nights if at all possible, and birds then will rarely fail to entice Reynard the second or third night.

Powdered strychnine, just sufficient to cover nicely a threepenny-piece, is the usual dose.

POULTRY.—Supplies of shell grit and charcoal should always be available. Sow a mixture of English grass and clover; this not only removes taint in soil but provides excellent green fodder for stock. Where possible, lucerne and silver beet should now be sown for summer feed; liver (cooked) and maize aids to egg production during cold weather. Morning mash should be mixed with liver soup given to the birds warm in a crumbly condition. All yards should be drained to ensure comfort for the birds.

CULTIVATION.

FARM.—Plough potato land. Land to be sown later on with potatoes, mangolds, maize, and millet should be manured and well worked. Sow malting barley and finish sowing of cereals. Lift and store mangolds, turnips, &c. Clean out drains and water furrows. Clean up and stack manure in heaps protected from the weather.

ORCHARD.—Finish ploughing; plant young trees; spray with red oil or petroleum for scales, mites, aphis, &c.; carry out drainage system; clean out drains; commence pruning.

VEGETABLE GARDEN.—Prepare beds for crops; cultivate deeply; practise rotation in planting out; renovate asparagus beds; plant out all seedlings; sow radish, peas, broad beans, leeks, spinach, lettuce, carrot, &c.; plant rhubarb.

FLOWER GARDEN.—Continue digging and manuring; dig all weeds and leafy growths; plant out shrubs, roses, &c.; plant rose cuttings; prune deciduous trees and shrubs; sow sweet peas and plant out seedlings.

VINEYARD.—Thoroughly prepare for plantation, land already subsoiled for the purpose. Remember that the freer it is kept from weeds from this forward, the less trouble will there be from cut-worms next spring. Applications for ungrafted resistant rootlings and cuttings must be made before the end of the month—see Journal for February, 1916. Pruning and ploughing should be actively proceeded with. In northern districts plough to a depth of seven or eight inches. Manures should be applied as early as possible.

Cellar.—Rack all wines which have not been previously dealt with. Fortify sweet wines to full strength.

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The Department of Agriculture

OF

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CONTAGIOUS ABORTION.*

An Agent in the Depletion of Dairy Herds.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer, Department of Agriculture.

That the dairy herds of Victoria have suffered very serious depletion of recent years is a fact admitted by all, and it behoves us to look carefully into the matter in an endeavour to ascertain to what extent this has occurred. What are the causes? Are they preventable? And what does the future hold in store?

The figures of the Government Statist, upon which we must estimate our losses, are based on the returns at 1st March. We must, therefore, go back over the last two years and bear in mind that the early part of 1914 and the latter part of 1915 were good seasons, during which the unknown quantity of natural increase would affect the return.

TABLE SHOWING CATTLE IN VICTORIA FOR THREE YEARS

(Based on Return on 1st March following).

—	Dairy Cattle.	Decrease.	Other Cattle.	Decrease.	Total.	Decrease.
1913	656,080	..	827,473	..	1,528,553	..
1914	610,517	45,563	752,025	120,448	1,362,542	166,011
1915	451,088	159,429	592,516	159,509	1,043,604	318,938
		204,992		279,957		484,949

* Paper read before the Farmers' Convention, 1916

5920.

Whilst the industry as a whole is short this amount it must not be taken as total loss, for a large percentage would be of stock slaughtered —for example—in 1914 the decrease was 166,011, but 112 548 head of this can be accounted for by excess of slaughtering over previous year, 59,317, and increase of exports, 40,869, and a decrease of imports, 12,362, so that the unaccountable total for 1914 is only 53,463. In the same way it will probably be seen at a latter date that a large proportion of the 1915 decrease went to the slaughter yards. In whatever way, however, the loss was incurred, the industry is short to an alarming extent.

Let us then turn from the figures and ask, what are the causes of this depletion which we know has occurred, and are they preventable.

We have not to search very far for the primary cause of our present position for nearly every farmer will be able to give figures of his losses during the recent drought. If, however, we look a little deeper into this question, and will be honest enough to throw off the convenient cloak behind which it has been so easy to hide, the majority of farmers must answer the charge of bad management. Let us, therefore, drop the term "drought" and say the primary cause is, in plain terms, bad management. It is not my purpose to enter into a discussion as to the why and wherefore of this, further than to say that a number of farmers are unable to give their losses, because they did not have any, and this for the reason that, by virtue of good management, they provided a sufficient reserve of fodder to see them through the trying time. The financial wisdom of their foresight requires no comment, and the answer to the question : "Are losses preventable under this head?" is emphatically "Yes." How many, however, will profit by their experience? Are we not committing just as great a folly at the present time, and are we not all just like the child being chastised by its mother, crying, "I will be good—I won't do it again" and repeating the offence as soon as the prior soreness loses its sting?

Another factor which has been in operation during the past few months, and is bringing about, not only a reduction in the present numbers, but a very serious position for the future of the industry, is the indiscriminate slaughter of females both young and old. Again the charge of bad management must be answered by the farmer. Bad management shortened our supplies—the demand then became keen, and bad management is answering the demand. Does a man who wishes to build a house sell the foundation posts on his property with the knowledge that he will have to buy more at a later date before he can commence building? Will any one claim it is good management to put a little cash in their pocket to-day with the knowledge that they must pay a lot out in the near future for the same article? The man who is to-day resisting the lure offered for calves and saving them for the foundation of a herd (for the bad manager) will, in the near future, reap a handsome reward, for I cannot see how there is to be any material decrease in the price of cattle for some years—if ever.

Taking my illustration of house building a little further, what sort of structure will be erected by the farmer who obtains some of his timber at one place, and some at another, without reference to its quality, its strength, and the duration of its seasoning, &c. His house will

quickly warp, twist, and split, and need constant repairs. The careful builder will know his timbers, and build a lasting edifice, and will oil, paint, and varnish it. So with the dairy herd—the good manager will know his cows, will use a good bull, one that will improve his herd, not merely get calves, he will rear his females, and by painting the inside with nourishing food build up a business that gives him a handsome profit. By knowing his animals he can improve them, by avoiding indiscriminately purchasing, he will obviate the danger of introducing disease into his herd.

This brings us to another cause of depletion, and one which the bad manager is going to keep with us in good or bad seasons—I refer to contagious abortion. This disease has been known to exist for many years. As far back as 1567 attention was drawn to it in England, but it was not until 1876 that it was conclusively proved to be due to infection. It then took twenty years to find and prove which organism was responsible—this was done in 1896, by Bang. The losses that occur as the result of this disease are enormous—not, unfortunately, from the death of the infected animals, for if this occurred it could more easily be controlled; but by virtue of the fact that every affected animal lives and acts as a centre of distribution, and thus the disease becomes difficult to eradicate.

It has been estimated that in some parts of England 50 to 60 per cent. of cows are affected, while the evidence given before a committee appointed by the Board of Agriculture and Fisheries in 1909 to inquire into the disease, goes to show that approximately 25 per cent. of animals in England and Scotland were infected. Gilruth, some years ago, estimated the loss to the dairy farmer in New Zealand as between £200,000 and £300,000 per annum.

How, some may ask, do the losses arise since the cow does not die. The one who asks this question has evidently not experienced the trouble, and should use his utmost endeavours to keep his herd free. The losses may be classified under three headings, viz.:—

1. Loss of calf aborted. This is probably the smallest, yet, in view of our shortage of stock, a very serious one.

2. Diminished milk yield due to premature calving. This is a very considerable loss, for it is well known that a cow that slips her calf seldom if ever comes to her full milking capacity in that year.

3. A combination of the previous two repeated in subsequent years. This is the most serious loss, for the sterility that so often follows, and is shown by the cow persistently returning to the bull after she has aborted, means that if she does hold to the bull she comes in too late in the season to make her maximum profit or remains barren, then for several years the calf is not produced and the cow remains dry.

It is extremely difficult to give an accurate estimate as to what this all amounts to for reasons at once obvious, but let us take some figures in order to see the possibilities. So as not to be classed as too big an alarmist, by taking the English figures,—25 per cent. affected—let us suppose that 10 per cent. of the cows in Victoria were to become affected with the disease; on the latest statistics there are 451,088 cows in

Victoria; this would mean 45,000 cases of abortion; then we will have an account something like this—

Loss of calves 1st year	45,000
Diminished milk yield from 45,000 cows, say, $\frac{1}{3}$ of 300 gallons ...	4,500 000 gallons.
In the 2nd year $\frac{1}{2}$ of these fail to get in calf, and the other $\frac{1}{2}$ abort—	
Loss of calves	45,000
Total loss of milk, 22,500 cows, say, 300 gallons each.	6,750,000 gallons.
Diminished yield from 22,500 cows, $\frac{1}{3}$ of 300 gallons	2,250,000 ,,

Convert this into money value, and a loss of between £300,000 and £400,000 per annum is evident. I have not so converted the figures, for who can say the value to the industry of a calf just born; to the farmer it is worth what he can get for it, but there is another value to be considered and that is the potential one, of motherhood to raise a subsequent generation. Whatever the figure taken the loss is sufficiently serious to justify our attention to the cause.

Abortion may be classified under two headings, viz.:—

1. Accidental, when owing to injury or disease of mother or fœtus, the fœtus may be expelled prematurely.

2. Contagious abortion, due to changes in the fœtus and its membranes induced by a specific organism, which brings about its expulsion without any material evidence of disease in the mother.

It is the latter form we are chiefly concerned with, but I would say to all, until you have satisfactory proof that an abortion is accidental, it would be wise to consider it as contagious. The reason for this will be more clearly seen at a later stage.

Cause.

The organism, which can be isolated, and has been shown to be responsible for this disease, is a very small bacillus which does not form spores, and which can be grown artificially without much trouble. Corrosive sublimate or perchloride of mercury has been shown to be perhaps the best agent to destroy it, but in internal secretions, and inside the womb, it may retain its virulence for many months.

Injections of pure cultures into the vagina of healthy pregnant cows will induce abortion in eight to ten weeks, or feeding with the same, will bring about the event in one to two months. In any case the change that is set up is an inflammation of the womb, and the membranes, which causes an extensive exudate to form between the uterus of the mother and the membranes surrounding the fœtus. This leads to a partial detachment of the fœtal membranes, with the consequences that abortion, or premature expulsion of the fœtus, may occur at any stage of gestation.

Natural infection may take place from the external genitals, a bull that has served a cow recently aborted will transmit the organism to the cows he next serves; further, bails, stalls, bedding, camping places, &c., which become contaminated by the discharges from the vagina will serve as convenient means of transmitting to other cows which occupy the

same position. By contamination of pastures in the same way, the organism may pass through the alimentary canal, and this method is probably the chief one in the spread in a herd of pregnant cows.

An abortion occurring on a farm is regarded by the farmer in far too light a manner—not until a number have occurred does he realize the gravity of the situation. I have previously said that until proved otherwise every abortion should be regarded as of the contagious variety. This applies more particularly to the first case which occurs in a herd. As a rule, the farmer is content to say it is just a case of "slipping." If it should happen to be the contagious form of the disease the evil effects spread considerably, and when a number are affected the farmer becomes worried. The time to worry is at the first sign of trouble, not wait until the disease has gained a firm footing. Strict isolation of the first case to occur on a farm, until it is proved to be non-contagious, will be a splendid insurance against the remainder becoming affected, or, at any rate, it will assist considerably in keeping an outbreak within reasonable limits.

SYMPTOMS.

Cows are most likely to abort in the fifth or seventh month of pregnancy, though it may occur both earlier and later, there is a tendency for a cow that has once aborted to carry the calf for a longer period at subsequent gestations, if she becomes pregnant. Abortion is usually preceded by slight swelling of the genital passages, and an odourless discharge of reddish grey or yellowish colour occurs. At times it may be blood stained. If the cow is milking, the secretion becomes diminished, and the character of the milk changes to somewhat like colostrum or first milk. Within a few days the abortion takes place. If it is early in the period of gestation the membranes come away with the fœtus if later in the period, the membranes may remain attached for some time.

Following the abortion there is a continuous vaginal discharge of dirty brown or reddish material with sometimes fetid odour. This gradually diminishes, and may cease completely, and there is nothing to show the animal is affected except an inability to get her in calf again. The earlier after abortion that pregnancy can be obtained, the more certain is a subsequent abortion, whilst the longer interval that occurs the more likely is normal birth to occur.

DIAGNOSIS.

The infectious character of the abortion is indicated by the premonitory signs which usually appear two or three days before aborting, and by the continuous discharge after; in this discharge the organism may be found on microscopical examination. Laboratory methods of diagnosis have been tried, but up to the present no finality has been reached.

COURSE.

The disease persists in a herd for years, after the first case there is a period of calm followed by abortions in rapid succession until normal births are exceptional. This continues until two or three abortions per animal have occurred, when an immunity is apparently established and only newly introduced cows are affected. The course of the disease in Victoria appears to vary somewhat to that in Great Britain, for here,

there seems to be a far greater difficulty in getting cows to hold to the bull, the cows remaining sterile for a long period, so that a second abortion is not often seen. If we could be sure of a pregnancy the loss from the disease would not be nearly so severe.

TREATMENT.

The farmer who has been unfortunate enough to have an outbreak on his farm must make up his mind to apply himself energetically for some years' work. No half-and-half measures will answer the purpose, and, indeed, some who have tackled the problem with which they are faced, in a thorough manner, will say that even full measures are disheartening.

Bearing in mind the manner in which the disease is spread, the principal methods of treatment are apparent. Isolation stands out as indispensable. Under this heading I must again emphasize the necessity of looking after the first case. As soon as any premonitory symptoms are apparent the animal should be completely isolated, and the premises about which she may have been discharging thoroughly disinfected. If abortion has actually taken place every effort should be made to keep the apparently healthy cows in isolation, and away from the affected area, with the object of breaking the cycle of infection. The organism is expelled from the cow per vagina, and enters others either through the mouth or the vagina. Any break in this chain is going to assist in eradication, therefore, remove your cows from the source of infection and endeavour to destroy the organisms. This latter is done by the use of antiseptics, of which perchloride of mercury has been found most satisfactory. Its one drawback is that it induces some degree of straining, but this, however, need cause no alarm. For convenience, the whole procedure has been tabulated as follows:—

CONTAGIOUS ABORTION IN CATTLE.

GENERAL INSTRUCTIONS FOR GUIDANCE OF OWNER IN CONTROL AND TREATMENT OF OUTBREAK.

Stock.

1. When cows abort or "slink," the prematurely born calf, together with after-birth and any discharges, must be immediately destroyed completely by burning on the spot where they are found: these cows to be kept in paddock where they aborted.

2. Cows which have not up to the present aborted should be removed at once to "clean" paddocks and kept from contact with those aborting. Any subsequent aborting or showing signs of being likely to do so, must be immediately returned to the original paddock. The calf and after-birth, &c., to be destroyed on the spot as before.

3. Bull to be removed from herd and isolated.

4. A second shed or enclosure should, if possible, be made available for separate milking and treatment of cows which have not up to the present aborted. Aborting cows to be kept out of the shed or enclosures.

5. Intelligent responsible persons should be detailed for milking and handling aborting and non-aborting cows, and their respective duties must not be interchanged.

Treatment.

To be carried out in the order as hereunder indicated:—

1. Wash thoroughly the rump, hip to hocks, escutcheon, tail, back passages (outside) of cows nearest calving, and which have not previously aborted, two or three times a week for a period of three weeks with a 6 per cent. solution of copper sulphate or 1 in 1,000 solution of corrosive sublimate. Follow this with injections into genital passage of lukewarm corrosive sublimate—1 in 3,000. Repeat whole process after an interval of three weeks.

2. Treat in same way—

(*a*) Cows now in milk, whether in calf or not, and which have not previously aborted, twice a week.

(*b*) Cows in which longest time has passed since they aborted.

(*c*) Cows which have recently aborted, once a day for one or two weeks, then two or three times a week for two weeks, or until discharge has stopped.

3. *The Bull.*—Clip long hair from sheath and belly. Wash skin surrounding with same solution as for cows. Subsequently flood interior of sheath with corrosive sublimate solution 1 in 3,000, closing the opening with hand and manipulating fluid well into furthermost parts of sheath.

(Note.—This should be done the day before bull is required for service, and repeated two or three times for a week after each service. The bull may be required to be thrown for the purpose.)

4. Newly-born calves born to full time should be sponged all over with the copper sulphate solution before being allowed to mix with herd

5. Cows which have aborted should not be served for at least four months after aborting.

Premises.

1. (*a*) Thoroughly sweep down whole interior of milking shed, collect refuse, and dispose of as indicated in paragraph (*c*).

(*b*) Scrub bails, mangers, and other woodwork with hot solution of washing soda (1 lb. to 4 gallons of water).

(*c*) Collect manure, urine, and other refuse in convenient receptacles at shed door, convey to place inaccessible to cows, and thoroughly sprinkle with 6 per cent. copper sulphate solution.

(*d*) Thoroughly spray ceilings, bails, posts, and floor with 6 per cent. copper sulphate solution.

2. Clean up all refuse immediately after each milking, and treat as in paragraph (*c*).

3. Repeat spraying of shed with the solution of copper sulphate at least once every week during treatment of cows, and subsequently limewash thoroughly with 1 lb. of crude carbolic acid to four gallons of freshly-made limewash.

Note.—Care should be exercised in using above solutions on account of their poisonous properties.

For irrigating or injecting into the calf passages special metal or india-rubber pumps can be procured at surgical instrument suppliers. *In using the perchloride of mercury solution ordinary metal syringes, or mixing dishes, should on no account be used.* A simple and convenient apparatus can be made by fixing a large enamel funnel in one end of a 2-ft. piece of india-rubber tubing and a small long wooden or vulcanite nozzle in the other.

Never dispose of a cow that you can get in calf; by keeping her you will more quickly bring the disease to a standstill than by disposing of her and bringing fresh material on to the farm. Keep newly purchased pregnant animals isolated until natural calving occurs.

METHODS OF PREVENTION.

Several methods have been from time to time promulgated, but nothing definite has been determined. Subcutaneous injection of 2 per cent. solution of carbolic acid 10 c.c. per week has been highly spoken of by some authorities, others have had no success.

Immunization experiments have been conducted but are not yet satisfactory for general application.

THE FUTURE.

Let us glance at the outlook for the future in relation to contagious abortion. There are two channels to direct our attention to.

1. *Effort by the Farmer.*—This effort is one which all should make first by trying to keep clear of the disease by—

(*a*) breeding your own stock:
(*b*) isolating and observing all purchased animals;
(*c*) using your own clean bull.

Second, by trying to check the spread by—

(*a*) following the directions for control;
(*b*) never selling an aborted cow. This will only spread the disease to the unfortunate purchaser. Some day you may be the purchaser.

2. *Effort by the State.*—If the farmer will not exert his efforts under No. 1, then the second channel of control must be taken in hand. This would entail quarantine restrictions, and the prohibition of the movement of cows, either that have aborted, or have been in a herd in which abortion has occurred. This would be such a drastic procedure and such a heavy loss to owners that I will leave you to consider which course it were wiser to adopt.

In conclusion, let me urge upon you to keep your females, every female killed destroys a potential increase. Let every female of breeding age stand in the position of invested capital to you from which you will annually draw your interest in the shape of calves and milk.

The market of the world requires some concern to supply meat, Australia offers the finest opportunity for the foundation of such a concern, get a share in the shape of a female. Do not be led away by high prices now to dispose of your share, rather use your utmost endeavour to obtain more shares. The price of them will not go back.

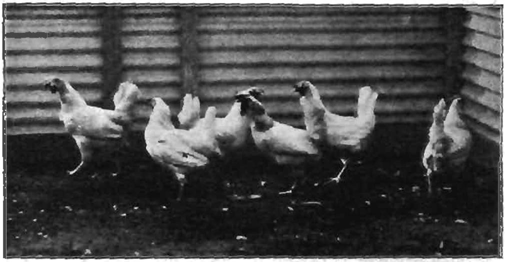
REPORT ON THE FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-16.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

By A. Hart, Chief Poultry Expert.

RECORDS ESTABLISHED.

In presenting the annual report of the laying competition which has just been concluded at Burnley, I would instance the immense extent of the poultry industry in both England and America. During the year 1913 the value of the eggs imported into England from other countries amounted to £9,590,602, while poultry valued at £954,540 was imported during the same period, making up a total of £10,545,142 for one year.



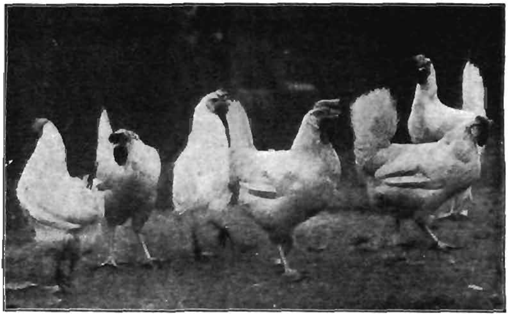
W. H. Robbins, White Leghorns, 1st prize and gold medal, for dry mash section, 1,638 eggs, twelve months' test; also 1st prize for greatest market value of eggs for the year, £10 19s. 10½d.

Although these figures were materially reduced during 1915 through war conditions, there were still very large quantities of eggs and poultry imported into England. With such a vast demand in sight there should be every inducement for Victoria to endeavour to provide a portion of the eggs and poultry that are annually required.

In the United States of America the figures given in connexion with the poultry industry show what immense proportions it has attained. According to the *Chicago Live Stock World*, the egg return from the United States for one year amounted to 280,000,000 dollars (£56,000,000). The total value of the gold, silver, wool, and sheep for the same year amounted to 272,434,315 dollars—£1,531,337 less than what was derived from the poultry industry alone. Poultry returned £4,000,000 more than the cotton crop, and £10,000,000 more than the wheat crop for the same year. Such enormous figures as the above show

what importance the poultry industry has reached in the States, and it should certainly be a strong incentive for the advancement and extension of the business in our State, where we possess advantages which in many ways are very much more favorable than those obtaining in America.

The Fifth Annual Laying Competition furnishes a large amount of interesting as well as educational features of much value to poultry-keepers generally. The importance of the tests at Burnley is admitted by all who are associated with the poultry industry, and the results of the tests of 1915-16, taken as a whole, have never been before equalled. Although no sensational record has been put up by any one pen, the total averages from the whole of the competing birds are well ahead of previous years. As the uniform egg production of the whole of the birds is much better than usual, it is of greatly more value than a high record from any one pen would be. The figures in connexion with this

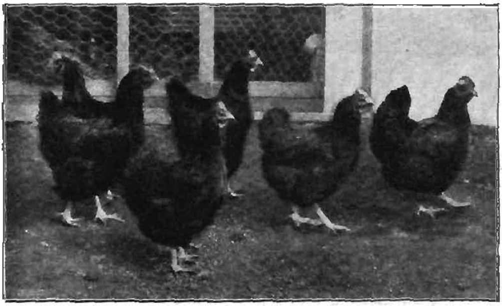


G. McDonnell, White Leghorns, 1st prize and gold medal, wet mash section, 1,661 eggs, twelve months' test. Value £10 19s. 6½d.

test were very satisfactory. The birds were divided into three sections. The light breeds, dry mash test, had nineteen entries, and the heavy breeds, wet mash test, twenty entries, making a total of 570 birds in the three sections. This year no replacements of birds which became incapacitated from any cause whatever were allowed. In my opinion, this is the only rule to follow if reliable records are required. When extra birds are allowed to take the place of those that have been removed from the pen through injury, &c., the total number of eggs produced by that pen cannot be fairly claimed as being from six birds, and the figures produced under these conditions cannot be classed as a record. This rule has been found satisfactory in every respect, and, although some owners have lost the chance of winning by the death of competing birds, they agree that it is a misfortune for which there is no remedy. During the twelve months twenty birds dropped out from sixteen pens through various causes; this reduced the egg production

from these particular pens and also made a difference to the total laying from the whole of the birds for twelve months.

An idea may be given as to the great improvement made in Victoria in respect to egg producing White Leghorns during the past eleven years, the greater portion of which may be credited to the influence of laying competitions. At Dookie College, in 1904-5, six White Leghorns won the test with 1,313 eggs for twelve months. In the test just concluded at Burnley, the winning pen of six White Leghorns in the wet mash section produced 1,661 eggs, this being an increase of fifty-eight eggs from each bird, working out an extra return of 6s. per bird. This conclusively proves that the laying competitions must have benefited poultry-keepers to a great extent, and also largely increased the yearly value of the industry in the State. The five leading pens of White Leghorns produced a total of 8,160 eggs for the year. This means that thirty birds put up an average of 272 eggs each, bringing in a gross return of 35s. 10d. per bird, and a total of £52 16s. from the thirty.



G. E. Graham, Black Orpingtons, 1st prize and gold medal, heavy breeds, wet mash section, 1,507 eggs for twelve months' test. Value £9 18s. 6d.

This certainly constitutes a record in any test in the world for that number of birds. White Leghorns were very much in the majority, the whole of the birds in the light breeds tests being of that variety. Although it must be admitted that White Leghorns are at the top as prolific egg producers, it is a matter for regret that owners of some of the other light breeds do not make an effort to improve the laying qualities of their birds and enter into competition with White Leghorns. When it is considered what a marvellous improvement has been effected in the latter breed, it appears quite feasible that, if equal attention were given to other breeds, it would result successfully. With respect to the heavy breeds section, it is pleasing to find that several breeds are included. Black Orpingtons keep up their reputation by holding the two leading positions. The practically new breed of Rhode Island Reds have made a name for themselves as layers by filling the third position, and a pen of Flaverolles has done really well by taking ninth place. One pen of

Silver Wyandottes did fairly well. White Wyandottes and White Orpingtons competed, but were low down in the test. The bulk of the Black Orpingtons which competed were hardly up to our Orpington standard. This has, however, been remedied to a great extent in the present test in which the bulk of the birds are of fair type and nice size. In comparing the size of the eggs produced they show a general improvement. Although eggs should not be under 24 to 25 ozs. per dozen, the production of extremely large eggs should not be encouraged. The highest average weight of eggs was gained by six Black Orpingtons, their eggs averaging 27 ozs. per dozen. Birds from this strain should be useful to improve the size of eggs where they are on the small side.

The total number of eggs produced for the year from the 570 birds was 125,119. Of this number, the 336 birds in the light breeds, wet mash test, contributed 75,900, working out at an average of nearly 226 eggs per bird. The 114 birds in the light breeds, dry mash test, produced 25,164 eggs, being an average of 220½ from each bird. The 120

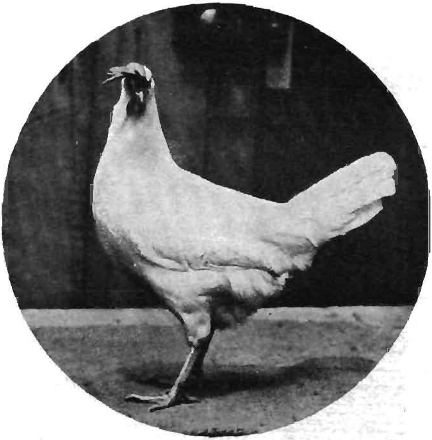
Good Laying Type of Head, one of six White Leghorns, with an average of 283 eggs in 12 months.

Bad Laying Type of Head, one of six White Leghorns, with an average of 144 eggs in 12 months.

birds in the heavy breeds, wet mash test, produced 24,055 eggs, this being an average of 200½ eggs per bird. The average price received for the eggs was 1s. 7d. per dozen. This works out a total gross return of £825 8s. from the 570 birds, making an average of 28s. 10d. from each bird. This must be regarded as a very high average return from such a number of birds of various breeds, and proves that the stock are really good, and that the methods of feeding, &c., are on the very best lines. As the price of feed was very much higher than usual the cost per hen amounted to just under threepence per week.

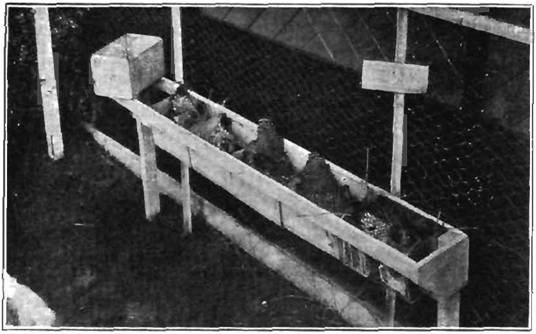
In comparing the egg production from the birds fed on wet and dry mash respectively, there is not so much difference as there was last year. The result shows that birds fed on a properly constituted dry mash will give good results, and both systems may be recommended for egg production, the conditions and surroundings under which the birds are kept being the factors in influencing a choice. The two methods of feeding

were conducted separately in the light breeds The wet mash was composed of: Bran, 16 lbs.; ground oats, 4 lbs.; pollard, 20 lbs.; peameal, 4 lbs.; oatmeal pollard, 4 lbs.; minced liver, 8 lbs. The whole was mixed together with liver soup, given warm in a crumbly condition. About 2 ozs. were allowed to each bird in the morning. One ounce mixed with green lucerne, chaffed and silver beet was given at mid-day. For the evening meal, wheat, oats, and crushed maize were supplied, varied according to appetite and weather conditions. From 2 to 2½ ozs. were allowed to each bird. Onions were given occasionally as a tonic. The formula of dry mash, which was introduced by myself, has been very successful. It is made up as follows:—Bran, 20 lbs.; wheat pollard, 48 lbs.; oatmeal pollard, 33 lbs.; peameal,



How to increase egg production and the size of the egg.—Single test or trap nest your pullets for one year.

16 lbs.; ground oats (portion of hulls removed), 10 lbs. To this was added 2 lbs. of black or brown sugar. The whole was well mixed and placed in an automatic hopper, to which the birds had access during the day. Animal food, generally consisting of boiled liver, at the rate of 1 oz. to each bird, was given three or four times a week. Green lucerne, silver beet, or clover, was chaffed and fed at mid-day. The evening meal was composed of wheat and oats, and during cold or rough weather maize was added. Shell grit and charcoal were always on hand, and a constant supply of water was given by troughs running the full length of the pens.



Vermin-proof nest, simple and effective.

To get best results out of hopper feeding, chickens must be reared on dry mash.

The competition was in charge of Mr. J. T. Macaulay, who performed his many and varied duties efficiently, and it is to his capable management that a great deal of the success attained can be ascribed. He took

a keen interest in the various tests, keeping a complete record of the eggs produced daily from the different pens, as well as putting down many other important particulars in connexion with the tests. In this way he supplied a fund of useful information of much value to poultry-keepers generally.

Although the competitions at Burnley have been very successful so far as they have gone, there is one point in which an improvement might be made. It is the indicating of the highest egg producing birds in any one pen. When six birds are penned together, there is certain to be a difference in their egg production, and as under the present system the whole of the eggs from each pen are averaged, the best layer cannot be indicated. This, in my opinion, is a mistake which should be remedied. I would suggest that trap-nests or single pen testing be given a trial. To instal the latter right through the whole of the tests would, perhaps, be too costly, but it might be suggested that a few pens should be kept under these conditions. The trap-nest system would not be so expensive, and it would, I think, be advantageous in many respects to give this method a trial with portion of the competing birds in each test. It would then be easy to indicate the best individual layers and make a selection of the highest grade egg producers to improve the stock.

In conclusion, I would again bring under notice the very favorable conditions under which poultry-keeping can be carried on in this State, either as an adjunct to farming, dairying, or fruit-growing. At present we are producing very little more eggs and poultry than is required for Victoria's consumption. This is influenced to a great extent at the moment by existing war conditions, but under normal conditions there should be a very big surplus of both eggs and poultry in our State which would be available for outside markets. The demand in England is practically unlimited for these products. With suitable conditions in packing and shipping, Victoria should, in the near future, participate largely in the big yearly amounts which are distributed to other colonies by England for both eggs and poultry.

Owner	Breeds.	Total number of eggs laid.	Average number per bird.	Average market value at 1s. 7d. per doz.
				£ s. d.
LIGHT BREEDS.—WET MASH.				
1. G. McDonnell ..	White Leghorns ..	1,661	276⅚	10 19 6½
2. H. McKenzie and Son..	,, ,, ..	1,637	272⅚	10 16 3¼
3. W. M. Bayles ..	,, ,, ..	1,623	270½	10 14 8¾
LIGHT BREEDS.—DRY MASH.				
1. W. H. Robbins ..	White Leghorns ..	1,638	273	10 19 10½
2. H. McKenzie and Son..	,, ,, ..	1,601	266⅚	10 11 3
3. A. A. Sandland ..	,, ,, ..	1,457	242⅚	9 12 3
HEAVY BREEDS.—WET MASH.				
1. C. E. Graham ..	Black Orpingtons ..	1,507	251⅙	9 18 10
2. Marville Poultry Farm	,, ,, ..	1,447	241⅙	9 10 11
3. E. W. Hippe ..	Rhode Island Reds	1,423	237⅙	9 7 9

Record of Eggs Laid 1915 16.

LIGHT BREEDS—WET MASH.

Pen No.	Owner.	Breed.	1915. April.	1915. May.	1915. June.	1915. July.	1915. Aug.	1915. Sept.	1915. Oct.	1915. Nov.	1915. Dec.	1916. Jan.	1916. Feb.	1916. Mar.	1916. April.	Total.	Average Weight per Dozen.	Position in Competition.
																	ozs.	
38	G. McDonnell ..	White Leghorns ..	38	128	132	138	145	147	166	159	154	154	137	123	40	1,661	24·5	1
34	H. McKenzie and Son	" " ..	48	137	109	113	144	153	175	157	155	148	127	128	43	1,637	23·3	2
42	W. M. Bayles ..	" " ..	61	106	122	112	133	154	166	162	148	139	138	130	52	1,623	23·9	3
23	Fulham Park ..	" " ..	21	95	97	105	128	146	170	155	156	149	135	130	55	1,542	27·3	4
59	W. G. Osburne ..	" " ..	55	68	67	116	146	151	150	159	162	144	130	134	52	1,534	25·2	5
5	J. J. West ..	" " ..	48	116	122	132	150	142	137	128	130	129	118	125	47	1,524	23·3	6
8	C. J. Jackson ..	" " ..	51	132	114	113	135	144	157	148	151	131	105	98	37	1,516	24·1	7
2	E. A. Lawson ..	" " ..	63	131	113	126	133	153	165	153	155	129	95	60	17	1,493	23·4	8
54	W. H. Clagin ..	" " ..	31	80	92	108	146	156	157	128	149	151	123	117	45	1,483	24·8	9
30	A. E. Silbereisen ..	" " ..	38	138	106	79	124	146	157	145	147	140	118	102	29	1,469	23·9	10
19	L. G. Broadbent ..	" " ..	70	145	124	97	134	158	143	147	142	127	120	51	9	1,467	24·5	11
3	J. H. Gill	" " ..	52	106	81	99	125	146	155	148	147	139	114	106	48	1,466	24·0	12
28	R. Lethbridge ..	" " ..	17	117	98	103	109	150	163	156	145	149	125	99	31	1,462	24·5	13
16	N. Burston ..	" " ..	59	114	106	114	132	123	138	128	140	127	121	92	47	1,441	23·9	14
50	John Hood ..	" " ..	36	92	93	130	120	142	142	150	136	119	119	118	40	1,437	24·3	15
44	Mrs. F. M. Oliver ..	" " ..	34	127	98	117	133	140	133	121	131	108	116	120	45	1,423	24·6	16
39	W. M. Sewell ..	" " ..	54	114	71	94	145	153	154	136	129	118	118	95	33	1,414	24·1	17
6	F. Doldissen ..	" " ..	62	130	91	115	138	132	147	126	116	109	104	95	48	1,413	24·3	18
58	Thirkell and Smith	" " ..	55	40	59	102	123	139	156	149	160	148	125	114	41	1,411	23·9	19
18	D. Adams ..	" " ..	50	115	103	116	129	125	120	123	151	133	104	101	37	1,407	24·5	} 20
27	J. A. Stahl ..	" " ..	..	49	91	113	136	147	156	147	153	145	123	103	44	1,407	23·9	}
9	J. Schwabb ..	" " ..	49	136	105	119	125	138	149	138	107	120	88	88	33	1,395	24·5	21
32	F. Hodges ..	" " ..	57	111	86	108	135	132	140	130	104	124	112	105	49	1,393	25·6	22
22	S. Buscumb ..	" " ..	50	79	49	52	127	153	152	140	149	144	129	126	42	1,392	24·0	23
7	Marville Poultry Farm	" " ..	66	119	104	116	126	135	157	141	141	129	90	53	8	1,385	24·3	24
11	J. B. Brigden ..	" " ..	31	92	90	118	135	143	155	140	141	124	99	88	24	1,380	26·1	25
4	R. Hay	White Leghorns (five birds)	38	128	88	110	132	138	151	129	126	108	96	91	35	1,370	22·7	26
26	A. Mowatt ..	White Leghorns ..	53	101	106	119	141	144	140	124	114	106	93	96	31	1,368	23·6	27
13	T. Hustler ..	" " ..	25	99	74	122	126	148	157	146	141	96	98	99	27	1,358	23·4	28
20	R. W. Pope ..	" " ..	24	99	66	76	132	147	159	149	147	135	106	86	30	1,356	23·9	29
10	A. E. Tuttleby ..	White Leghorns (five birds)	41	107	122	130	140	134	128	115	114	108	93	88	34	1,354	23·6	30
43	H. I. Merrick ..	White Leghorns ..	20	93	101	84	94	139	154	152	143	143	103	89	35	1,350	24·0	31
15	H. N. H. Mirams ..	" " ..	38	92	95	96	113	137	141	138	125	129	123	94	28	1,349	25·6	32
21	E. B. Harris ..	White Leghorns (five birds)	69	114	116	146	143	149	146	104	123	102	74	32	..	1,318	24·6	33
1	Mrs. H. Stevenson ..	White Leghorns ..	43	116	78	105	136	143	146	127	131	117	89	66	17	1,314	24·4	34

Record of Eggs Laid 1915-16—*continued.*

LIGHT BREEDS—WET MASH—*continued.*

Pen No.	Owner.	Breed.	1915. April.	1915. May.	1915. June.	1915. July.	1915. Aug.	1915. Sept.	1915. Oct.	1915. Nov.	1915. Dec.	1916. Jan.	1916. Feb.	1916. Mar.	1916. April.	Total.	Average Weight per Dozen.	Position in Competition.
																	ozs.	
24	Lysbeth Poultry Farm	White Leghorns ..	42	72	95	120	131	142	143	140	128	104	98	72	26	1,313	25·5	} 35
55	W. N. O'Mullane ..	,, ,, ..	27	83	88	100	130	143	142	124	115	116	96	104	45	1,313	24·6	}
46	R. Berry	,, ,, ..	51	90	30	72	129	138	142	121	132	116	118	111	45	1,295	24·6	36
33	A. W. Hall ..	White Leghorns (four birds)	66	116	50	93	125	133	137	128	127	122	90	81	24	1,292	25·3	37
12	G. Hayman ..	White Leghorns ..	30	79	61	79	131	143	146	135	119	111	105	106	39	1,284	25·0	38
60	H. C. Brock ..	,, ,, ..	67	126	54	109	131	127	126	115	107	108	94	84	33	1,281	24·9	39
41	J. A. Donaldson ..	,, ,, ..	17	60	74	110	120	137	142	130	140	125	92	93	33	1,273	24·9	40
36	Weldon Poultry Yards	,, ,, ..	55	93	73	62	91	130	153	155	113	120	110	75	12	1,272	24·2	41
49	Bennett and Chapman	White Leghorns (five birds)	23	75	134	105	122	143	153	132	116	116	83	39	4	1,245	25·8	42
40	C. C. Dunn ..	White Leghorns ..	45	82	87	73	78	131	143	116	129	131	90	91	38	1,234	25·3	43
48	C. J. Beatty ..	,, ,, ..	47	90	65	106	132	131	132	122	126	116	75	64	18	1,224	24·2	44
52	A. A. Sandland ..	,, ,, ..	62	109	89	55	98	118	125	114	115	117	109	88	19	1,218	25·0	45
37	A. Ross	,, ,, ..	30	58	35	101	120	123	129	125	129	122	110	100	34	1,216	24·1	46
53	W. G. Swift ..	White Leghorns (five birds)	43	142	131	122	153	147	124	107	68	59	49	48	13	1,206	24·2	47
45	South Yan Yean Poultry Farm	White Leghorns ..	20	79	72	101	110	128	140	121	117	90	87	93	37	1,195	24·1	48
25	Giddy and Son ..	White Leghorns (five birds)	62	112	84	107	116	121	138	132	118	93	64	35	8	1,190	23·7	49
47	J. C. Armstrong ..	White Leghorns ..	49	90	46	90	129	138	144	130	123	121	42	51	7	1,169	24·7	50
57	B. Mitchell ..	,, ,, ..	53	82	89	88	111	117	116	106	107	100	84	56	29	1,138	24·1	51
14	W. Flood	White Leghorns (five birds)	30	73	89	84	67	92	138	129	125	121	87	71	12	1,118	25·0	52
31	L. McLean ..	White Leghorns ..	36	48	13	46	119	130	128	134	138	119	105	49	3	1,068	24·5	53
56	C. Hurst	White Leghorns (five birds)	35	40	58	80	107	110	116	99	106	106	91	79	17	1,044	26·2	54
			2,436	5,565	4,886	5,746	7,063	7,749	8,139	7,522	7,391	6,854	5,788	5,032	1,729	75,900		

Record of Eggs Laid, 1915-16.

LIGHT BREEDS—DRY MASH.

Pen No.	Owner.	Breed.	1915. April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	1916. Jan.	Feb.	Mar.	April.	Total.	Average Weight per Dozen.	Position in Competition.
																	ozs.	
80	W. H. Robbins ..	White Leghorns ..	57	155	151	135	146	149	153	138	143	133	123	120	35	1,638	23·5	1
68	H. McKenzie and Son	,, ,, ..	40	115	118	89	138	164	160	163	157	154	126	140	37	1,601	22·8	2
76	A. A. Sandland ..	,, ,, ..	47	94	56	113	127	146	159	151	141	142	129	118	34	1,457	25	3
63	A. H. Padman ..	,, ,, ..	54	58	39	128	158	152	162	147	143	132	123	117	32	1,445	24·8	4
79	Lysbeth Poultry Farm	,, ,, ..	54	130	94	58	139	148	155	138	142	133	117	102	18	1,428	24·8	5
61	Mrs. H. Stevenson ..	,, ,, ..	19	31	60	122	152	161	162	136	138	126	107	111	49	1,374	24·4	6
67	C. C. Dunn ..	,, ,, ..	41	100	59	66	126	137	150	145	154	140	113	106	29	1,366	25·8	7
65	Thirkell and Smith	,, ,, ..	65	96	28	94	124	146	148	144	136	133	113	104	24	1,355	25·7	8
62	Benwerren Egg Farm	,, ,, ..	61	104	18	62	140	153	169	155	154	138	110	60	10	1,343	24·1	9
66	E. A. Lawson ..	,, ,, ..	68	131	67	56	130	149	145	116	140	114	109	78	9	1,312	25·7	10
69	E. MacBrown ..	,, ,, ..	52	106	114	129	117	112	144	137	125	125	75	57	12	1,305	24·4	11
72	Mrs. E. Zimmermann	,, ,, ..	69	120	73	81	122	134	134	127	121	124	103	70	21	1,299	24·2	12
71	Moritz Bros. ..	,, ,, ..	15	93	97	86	93	139	153	143	149	138	99	65	10	1,280	25·1	13
78	H. Hanbury ..	,, ,, ..	49	95	111	116	124	130	136	105	117	95	84	88	27	1,277	23·8	14
73	C. L. Lindrea ..	,, ,, ..	22	12	9	93	147	156	157	134	118	140	129	110	43	1,270	26·4	15
77	South Yan Yean Poultry Farm	,, ,, ..	2	59	26	74	135	146	147	127	138	130	114	102	42	1,242	25·2	16
64	W. M. Bayles ..	White Leghorns (two birds)	61	120	91	96	120	139	146	136	120	53	46	44	18	1,190	24·5	17
74	J. H. Gill	White Leghorns (five birds)	9	22	66	92	106	112	124	110	107	99	87	65	14	1,013	24·2	18
75	Fulham Park ..	White Leghorns ..	..	36	77	94	78	106	125	104	116	90	79	53	11	969	25·9	19
			785	1,677	1,354	1,784	2,431	2,679	2,829	2,556	2,559	2,339	1,986	1,710	475	25,164		

Record of Eggs Laid, 1915-16.

HEAVY BREEDS—WET MASH.

Pen No.	Owner.	Breed.	1915. April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	1916. Jan.	Feb.	Mar.	April.	Total.	Average Weight per Dozen. (ozs.)	Position in Competition.
86	C. E. Graham ..	Black Orpingtons	8	107	151	150	156	153	153	141	115	123	106	112	32	1,507	25·6	1
97	Marville Poultry Farm	" "	73	126	99	137	156	153	122	118	115	99	107	115	27	1,447	24·2	2
89	E. W. Hippe ..	Rhode Island Reds	19	116	104	114	139	133	151	118	132	120	105	129	43	1,423	24·7	3
85	H. H. Pump ..	Black Orpingtons	39	105	118	120	142	135	133	119	107	114	116	112	34	1,394	25·3	4
92	J. Ogden	" "	10	29	78	122	153	145	158	153	148	134	119	96	32	1,377	23·9	5
81	Mrs. T. W. Pearce ..	" "	70	146	130	109	130	129	99	107	96	111	106	93	37	1,363	24·5	6
93	L. W. Parker ..	Black Orpingtons (five birds)	6	50	110	146	157	153	143	112	117	93	98	84	27	1,296	27·6	7
88	J. McAllan ..	Black Orpingtons	44	107	107	103	142	131	123	98	115	83	91	72	48	1,262	24·5	8
98	K. Courtenay ..	Faverolles	..	8	76	87	133	142	133	138	131	114	127	112	45	1,246	24·1	9
100	J. H. Wright ..	Black Orpingtons (five birds)	54	147	140	125	135	126	98	105	92	88	55	38	24	1,227	24·1	10
87	W. C. Spencer ..	Black Orpingtons	35	94	89	132	114	133	121	101	99	92	79	105	11	1,205	24·1	11
84	Cowan Bros. ..	" "	9	70	112	117	108	140	133	114	96	117	96	79	11	1,202	24·8	12
90	Oaklands, P. F. ..	Black Orpingtons (five birds)	43	123	124	107	125	116	103	103	77	83	76	82	27	1,189	26·9	13
99	L. McLean ..	Black Orpingtons	37	102	83	125	118	115	130	109	115	87	79	58	14	1,172	25·8	14
91	A. Greenhalgh ..	" "	48	88	98	89	115	130	139	131	110	95	79	43	2	1,167	25·6	15
95	W. H. Forsyth ..	Silver Wyandottes	35	90	84	79	132	102	128	101	71	87	96	79	25	1,109	25·3	16
83	G. Mayberry ..	Black Orpingtons	27	76	48	81	105	120	110	108	90	93	74	46	6	984	24·9	17
94	D. Fisher	Black Orpingtons (five birds)	58	117	111	113	113	114	84	64	64	62	45	33	..	976	24·6	18
82	J. B. Brigden ..	White Wyandottes (five birds)	..	..	2	44	130	112	125	100	80	73	68	55	31	820	24·4	19
96	Stranks Bros. ..	White Orpingtons	46	123	67	69	91	78	59	33	29	27	19	33	13	687	24·5	20
			661	1,824	1,931	2,169	2,594	2,560	2,445	2,171	1,999	1,895	1,741	1,576	489	24,055		

A. HART,
Chief Poultry Expert.

PAST RECORDS.

HELD UNDER GOVERNMENT SUPERVISION.

For Six Pullets in Twelve Months.

SOUTH AUSTRALIA.—Highest record (White Leghorns), 1,589, R. Walsh, Victoria.

WESTERN AUSTRALIA.—Highest record, 1,564, A. H. Padman, South Australia.

NEW SOUTH WALES.—Highest record, 1,541, S. Champion, New South Wales.

QUEENSLAND.—Highest record, 1,564, Moritz Brothers, South Australia.

VICTORIA.—Highest record, 1,699, W. N. O'Mullane, Victoria.

VICTORIA.—Highest record previously, 1,667, J. H. Gill, Victoria.

NEW ZEALAND.—Highest record, 1,632, W. A. Nixon, New Zealand.

VICTORIA.—Highest record (Black Orpingtons), 1,562, J. McAllan, Victoria.

VICTORIA.—Heavy breeds—World's record for Winter test, J. H. Wright, 524.

LECTURES, FARMERS' CLASSES, AND STALLION PARADES.

The following letter has been addressed to the secretaries of all Agricultural Societies throughout the State by the Director of Agriculture, Dr. S. S. Cameron:—

I have the honor, by direction, to inform you that, on account of the financial stress, it has been determined to suspend the Government grant to agricultural societies.

The Department's arrangements for the holding of stallion parades, lectures, and farmers' classes, which have hitherto been associated with the subsidy, will be continued.

STALLION PARADES.

A somewhat curtailed time-table for stallion parades is being arranged, and will be forwarded to you shortly, so that the necessary local arrangements may be made as usual. It is desired, also, that the system confirming the award of prizes to certified stallions only shall be continued, in order that societies may obtain the benefit of the subsidy when it is resumed.

LECTURES.

Enclosed is a list of lectures and demonstrations for 1916.

On account of the shortage in the staff through enlistment, the usual number of lectures on veterinary subjects and agriculture cannot be given, but the whole

programme on other subjects can be arranged, and the Department will be glad *to comply with the requests of societies in this direction.*

It is suggested, in order to save the time of officers, and travelling expenses, that societies requiring the usual four lectures should arrange that at least two should be held at centres in the same district on two following dates, or as near one another as practicable.

FARMERS' CLASSES.

It has been decided to shorten the period for farmers' classes from a fortnight to a week, in order to lessen the inconvenience to farmers, farmers' sons, and others, and thereby promote larger attendances. It will also be possible, under this arrangement, to meet the applications of a larger number of districts.

The object of the Agricultural Department in offering lectures or classes free of charge to farmers and land-owners is to enable them to *obtain information on up-to-date farming methods, and the results of* the research and experimental work on the research farms in Victoria.

The Agricultural Department recognises the fact that Agricultural Societies and Progress Associations can assist largely in organizing meetings for these purposes, and for the benefit of the agricultural community generally.

A competent staff of lecturers is available from both the practical and scientific aspects of the subjects to be dealt with. A list of subjects and the staff employed for lecturing is submitted herewith.

The benefits to be derived are—

Agriculture.

A knowledge of our different crop requirements, and how to supply them for the greatest profit.
The best systems of cultivation.
The right kinds of manures and quantities to use for various crops and soils.
The saving of money in the purchase of manures.
Systems of farm management.
Main points in successful wheat culture.

Live Stock.

How to treat injuries and ailments in horses and cattle.
Systems to adopt in breeding.
General care of animals.

Dairying.

How to breed and manage dairy cows.
The building of sheds, silos, &c.
Methods of testing cream and milk.
Foods to feed for maximum results.
The management of pigs, breeding and feeding.
Cheese-making.

Apiculture.

How to handle and manage bees.
Treatment of their diseases and methods of control.

Poultry.

The best methods of breeding, selecting, rearing and managing fowls for table use or egg production.
How to feed for highest profits.
The treatment of common ailments.

Orchard and Viticulture.

The main points in making these industries successful.

STALLION PARADES.

The awards of prizes in all classes for stallions three years old and over at the Society's Show, to be subject to the possession by the exhibit of a Government certificate of soundness.

Stallion Inspection Parades will be held at different centres throughout the State prior to the commencement of the Show season (Time-table for Stallion Parades for 1916 will be available shortly after 1st May, 1916). The parade centres are so arranged that all owners of Show stallions have the opportunity of submitting them for examination for the Government certificate of soundness before the closing of entries for the Show. Show secretaries will require to obtain evidence of the possession of the Government certificate in respect of exhibits at the time of entry, and should not accept entries of other than certificated horses.

Immediately after the Show, secretaries of societies are required to forward the names *of all the horses* that have won the prizes in stallion classes, together with the names of the owners, to the Director of Agriculture.

FARMERS' CLASSES.

Applications should be submitted as early as possible. Thirty students at least must be enrolled before a class can be held.

The rent of hall and all local charges are to be paid by the Society; all other expenses by the Department. Arrangements must be made to insure the uninterrupted use of the hall during the time the lectures are going on.

A roll of attendances at lectures and demonstrations shall be kept.

The Agricultural Classes will extend over one week, consisting of not more than five evening lectures. Field demonstrations will be arranged for day-time instruction on days as required. The majority of the lectures will be illustrated by limelight views.

Examinations will be held at the conclusion of each class, provided not less than five students compete. The successful competitor at each class will be eligible to take part in a final examination for the A.N.A. gold medal in Melbourne.

Free rail tickets will be issued to students to attend this final examination. Five competitors or more must attend or no medal will be awarded.

Professional men, students in attendance at Agricultural High Schools and Colleges, or at the Continuation Schools, and teachers from such institutions or State schools, are not allowed to sit for the examination.

LECTURES.

Applications should be submitted as early as possible, and accompanying the application must be a list of the subjects (see pages 343-44)

which the Society chooses. The dates of lectures or classes will then be fixed by the Department, and if Societies will state the most suitable seasons for their districts the classes or lectures will, as far as possible, be arranged accordingly.

The president or secretary, or a member of the council or committee of the Society, must take the chair at each lecture or class, and must certify as to the number and *bona fides* of the attendance as above required.

The rent of the hall, advertising, and all other local charges are to be paid by the Society; all other expenses by the Department.

SYNOPSIS OF LECTURES AND DEMONSTRATIONS.

PRINCIPLES OF AGRICULTURE.

1. The plant food of the soil.
2. Cultivation methods and management.
3. Principles of manuring.
4. Valuation of artificial manures.
5. The management of the farm.
6. Special crops and catch crops.
7. Irrigation principles and methods.
8. Factors in successful wheat cultivation.
9. Results of experimental work.

VETERINARY SCIENCE AND LIVE STOCK SUBJECTS.

1. The structure and care of the horse's foot (lantern).
2. Brood mares and breeding mishaps (lantern).
3. Colic, constipation and other bowel complaints.
4. Ailments of dairy cows—milk fever, impaction, udder complaints.
5. Contagious diseases of stock—abortion, blackleg, tuberculosis, anthrax, pleuro-pneumonia, &c. (lantern).
6. Ailments of swine, or ailments of sheep.
7. Unsoundness in horses (lantern).
8. Principles of stock breeding—stud horses (lantern).
9. Teeth of the horse—age, defects (lantern).
10. Injuries to farm animals—first aid.
11. Principles of shoeing (lantern).

DAIRY FARMING.

1. Breeding and management.
2. Dairy buildings—silos and silage.
3. Dairy management.
4. Milk and cream testing.
5. Foods and feeding.
6. Pig breeding, feeding, and management.
7. Cheese making.

APICULTURE.

1. The honey industry—handling bees.
2. Breeding and management.
3. Diseases of bees—methods of control.

POULTRY BREEDING AND MANAGEMENT.

1. Incubation—natural and artificial—the rearing of chickens.
2. Breeds: payable or otherwise, table and export, eggs—how to select stock.
3. Turkeys: their care and management. Duck-raising and care.
4. Foods and feeding, with practical demonstration—mixing the mash.
5. Common ailments of poultry.

ORCHARD AND GARDEN WORK.

1. Fruit-growing—varieties suitable to the different localities, soils and sites.
2. Preparation of land; planting and pruning.
3. Cultivation—manuring and management.
4. Insect pests and fungus diseases and their treatment.

THE FRUIT INDUSTRY.

1. Handling, packing, grading, and marketing of fruit for export and local trade.

VITICULTURE.

1. Establishment of vineyard.
2. Phylloxera and resistant stocks—preparation of land.
3. Propagation and grafting—best varieties to grow.
4. Pruning and seasonable operations.
5. Wine-making and cellar management.
6. Drying raisins, sultanas, and currants; fresh grapes for export.
7. Vine diseases and treatment.

SUBJECTS AND STAFF.

Principles of Agriculture—Mr. A. E. V. Richardson, M.A., B.Sc.; Mr. Temple Smith.

Veterinary Science, Stock Management, Dairy Sanitation and Education—Messrs. W. A. N. Robertson, B.V.Sc.; R. Griffin, M.R.C.V.S.

Dairy Farming—Mr. R. T. Archer and Staff of Dairy Supervisors.

The Dairying Industry and Export Trade—Messrs. R. Crowe and P. J. Carroll.

Orchard and Garden Work—Messrs. P. J. Carmody, H. W. Davey, and E. E. Pescott.

Sheep Breeding and Management—

Viticulture—Mr. F. de Castella.

Flax Culture and Demonstrations at Shows—Mr. J. E. Robilliard.

Poultry Breeding and Management—Mr. A. V. Rintoul.

Poultry Dressing Demonstrations—Mr. A. Hart.

Potato Culture—Mr. J. T. Ramsay.

Tobacco Culture—Mr. Temple Smith.

Pig Breeding and Management—Mr. R. T. Archer

Fruit Industries—Mr. E. Meeking.

Insect Pests—Mr. C. French, jun.

Plant Diseases—Mr. W. Laidlaw, B.Sc., and Mr. C. C. Brittlebank.

Apiculture—Mr. F. R. Beuhne.

Cheese Industry—Mr. G. C. Sawers.

VITICULTURAL NURSERY, WAHGUNYAH.

Visit of Inspection.

(From the *Rutherglen Sun*, 14th April, 1916.)

On Wednesday afternoon about 70 persons interested in Viticulture and Citrus Fruit Growing accepted the invitation of Mr. G. H. Adcock, F.L.S., principal of the Viticultural College, and visited the nursery at Wahgunyah, for the purpose of viewing the work carried out at the nursery during the past year.

Mr. A. E. V. Richardson, M.A., B.Sc. (agricultural superintendent), Mr. F. de Castella (Government Viticulturist), Mr. P. J. Carmody (chief orchard supervisor), and Mr. H. Wilkinson (vineyard manager), were present.

Among the visitors was Hon. John Bowser, M.L.A., and a party from Wangaratta.

Mr. G. H. Adcock, F.L.S., in welcoming the visitors, pointed out that the officers of the Department were always pleased to see growers at the nursery. They wished the growers to become familiar with the work that was being carried out. Each year the staff endeavoured to improve on its previous year's work, and he trusted that in a few years the acreage of the vineyards, in the district, would be equal to what it was previous to phylloxera. He had pleasure in inviting all present to make an inspection of the nursery, and during their walk through the nursery, questions would be answered and explanations given.

The visitors were then escorted over the nursery by Mr. Adcock and the officers of the Department who were present, a stay being made at numerous points of interest, where brief addresses were delivered and operations which had led to the present results were explained. Rather less than a quarter of a million phylloxera-resistant vine cuttings were bench grafted. The strike was an excellent one, and the general appearance of the young vines (see photo.) which will shortly be lifted and distributed, left nothing to be desired.

Half a million ungrafted resistant cuttings had also struck in a most satisfactory manner, and the number of ungrafted resistant rootlings available for those who intend to reconstitute by the method known as field grafting will probably be in excess of requirements.

The oranges, of which 24,000 were being budded, excited much attention. Demonstrations of this interesting operation were given by the Horticultural Staff.

The recently installed pumping plant driven by a Ronaldson and Tippett's 12 h.p. oil engine, manufactured in Ballarat, was much admired. This plant, which has been working most satisfactorily during the summer months, is capable of irrigating the nursery when the whole of the available land will be under nursery stock.

On returning to the grafting shed, afternoon tea was partaken of.

Mr. F. de Castella, in the course of a short address, which he was requested to deliver, said that it was gratifying to compare the present condition of the Rutherglen wine industry with what it was on the previous Field Day, just a year ago. The difference was enormous. The recovery after last year's drought was most satisfactory, and bore out the reassuring forecast then made. The vines had very wisely been pruned

rather short in most vineyards; this had curtailed the yield somewhat, but the state of the vineyards generally was now excellent, especially in view of the ordeal of last year, and gave splendid promise for the future.

What are the best stocks to plant? This is a vitally important question, but one which is not always easy to answer. It is largely governed by considerations of adaptation and affinity; in other words, of soil and scion.

Experimental plots were no doubt of great value. We have some which have given most useful information. There was room for much more experimental work of the kind, but propagation work had absorbed the viticultural resources of the Department so completely that the establishment of further experimental plots had not been possible. Unless numerous, such plots were not absolutely reliable—an isolated success or failure might easily be misleading—evidence might sometimes be contradictory. The whole district was one vast experimental plot, the most striking feature of which was the very general success of the stocks we now propagate. Only in very rare cases were marked failures

Visitors assembling at "callousing" and "hardening off" houses for vines, State Nursery, Wahgunyah.

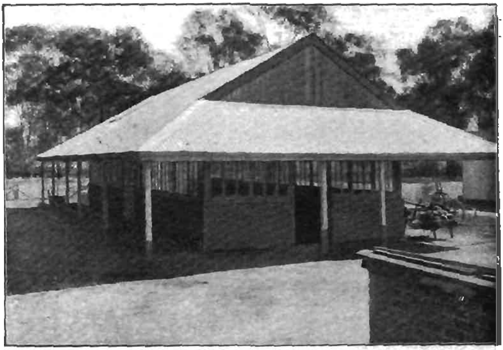
noted. Voluminous records have been collected during the past two seasons, the most useful deductions from which would shortly be made available. It was interesting to note that even in France, where vine-growing is an industry of such enormous importance, complaints have recently been made concerning the lack of experimental plots, especially for testing drought resistance. Algeria, Sicily and Spain furnished interesting information; much literature had recently been secured from these countries.

The Algerian summer is very like ours. In that country the Berlandieri and its hybrids continue to greatly increase in popularity; 420A in particular tends to become the basis of reconstitution. It is, unfortunately, difficult to bench graft, though one of the easiest and best to field graft or bud. 41B is also an excellent stock; vines grafted on it bear very heavy crops; it is a poor grower at first and wants kind treatment for the first couple of years. 333 is another good Berlandieri hybrid, which was at first unduly neglected. The well known 1202 is

very popular in Algeria; especially in vineyards where it is well treated it yields very heavily and is held to be one of the stocks which responds best to heavy manuring.

Are we to abandon any of the stocks we now propagate? He did not think so. We have already given up the Riparias and Rupestris Martin, and they were not to be regretted. Doubts had been raised as regards Cape Metallica, yet in many vineyards it was quite satisfactory and yielded excellent crops. There certainly are some scions which do badly on it. In Mildura it is highly thought of. A.R.G. 1, though disappointing in some parts of Sicily, is one of our best stocks here; it is also excellent for irrigated land, as it suffers less than most from faulty drainage.

No doubt the general success of so many stocks here was due to the wonderful suitability for the vine of most of our vineyard soils, and



Vine grafting shed, State Nursery, Wahgunyah.

particularly the friable nature of the subsoil once it has been properly broken up to a sufficient depth. Thorough cultivation could not be too strongly urged. Drought resistance depends perhaps almost as much on proper soil treatment as on the choice of stock.

Several other stocks of much promise were dealt with, such as 106.8, the Riparia x Cordifolia Rupestris hybrid, so highly thought of in France for stiff, silty soils; also 84.3, 554.5, 62.66, 125.1, &c. Some of these had special points to recommend them. It was curious, however, that they were not more spoken of in recent viticultural literature.

A recent article by Professor Ravaz was quoted, dealing with stocks for dry situation, in which the contradictory nature of the question was pointed out. He holds the pure Rupestris to be poor drought resisters; they often suffer more than Riparia even, probably on account of the greater leaf surface, which evaporates more moisture.

Professor Ravaz gives the following list of stocks suitable for dry situations:—

Rich, dry, shallow soils, with stiff subsoil.—Riparia 106.8, 420A, 41B.

Poor, dry, shallow soil.—3306, 3309, 41B, 420A.

Rich, dry, deep soil (friable subsoil).—Riparia, 106.8, 420A, 41B, 3306, and 3309.

Poor, dry, deep soil.—Rupestris du Lot, 3306, 3309, 420A, and 41B. If the soil is very wet in winter and very dry in summer, as sometimes happens, 1202 and A.R.G.1.

It may come as a surprise to some to see the old Riparia still mentioned. It is not suitable for Australian conditions. It will be also noted that 41B and 420A are recommended for all the above soils.

Professor Ravaz's advice concerning stocks to produce high gravity musts is also interesting—in his opinion it is stocks with Riparia like be-

Bench grafted rooted vines, 9 months old, State Nursery, Wahgunyah.

haviour which should be selected—one requires vines with slow and regular vegetation, the activity of which ceases early in the season. In a word, the vines should behave in as nearly as possible the same way as though they were growing on a dry hillside. The stocks recommended are Riparia Gloire, 106.8, 420A; and 3306, 3309, and 101.14, if the soil be poor.

For sandy soils strong growers are not recommended. Their fruit would not set. Vialla (an old-fashioned stock in France) is recommended, as well as 106.8 and 420A. The Riparia and Rupestris hybrids (3306, 3309, and 101.14) grow rather too vigorously on sandy soils.

Malbeck grafted on du Lot has proved an unhappy union in most of our vineyards. The setting of the fruit is very unsatisfactory. Numerous experiments conducted last spring have had no appreciable results. A method worth trying is extra early pruning to weaken the

vine, and thus render it more fruitful. To be effectual, the pruning must be very early—as soon as vintage is over. If postponed until May, the vine is strengthened, rather than weakened.

Extra early pruning delays the start of growth the following spring. Vines which start to grow late are usually better bearers, because the vegetative action commences when the weather is warm. Pruning immediately would be worth trying on Malbecks grafted on du Lot.

The mysterious disease known in France as *Court noué*, literally short joint, was referred to. It seems to have some relationship with what we know here as "Rogue" vines, occasionally to be met with in most vineyards. Vines which show a characteristic abnormal vegetation and bear little or no fruit. In the heavily manured vineyards of Southern France, *Court noué* has sometimes done much damage. No parasite has yet been discovered as its cause, but it is claimed in some quarters that

New pumping plant and fluming, ungrafted resistant rootlings in foreground, State Nursery, Wahgunyah.

a marked improvement in the affected vines was obtained by pruning before the fall of the leaves and painting all cuts made with the secateur with coal tar. Growers were recommended to try this treatment on any "Rogue" vines in their vineyards.

Citrus Nursery.

One of the features of the work being carried out is the propagation of the orange and lemon tree.

Mr. Carmody stated that there was a great diversity of opinion throughout the world as to which of the stocks was the best for citrus trees. California favoured the sour orange stock as being the hardiest and as having an exceptionally good rooting system. Florida also favoured this stock. Of late years, the Tahiti orange stock was popular with some American growers, but it had a dwarfing effect.

In New South Wales, the sweet lemon was regarded as the best. From a nurseryman's point of view, this stock was the most profitable, as it was easily raised and a very free grower. Mr. Snider, who was in charge of the nursery, regarded this stock as excelling all others, not only from the nurseryman's point of view, but also from the growers'. He had had a long experience of this stock in Palestine, and knew of groves of 50 years' standing to be highly profitable and to withstand hardships and disease superior to any other stock in general use. Other growers were favorable to the Citrus trifoliata, a stock that had a dwarfing effect on the scion, but under unfavorable soil conditions was, perhaps, the hardiest of all.

During last year's drought the Mildura growers applied to their citrus groves the water from the Murray, which, late in the season, was exceptionally salty, and had a most disastrous effect upon the orange trees. The leaves fell off, and the trees were in a very perilous condition, and the first application of fresh water during the subsequent irrigation season accentuated the trouble to an alarming extent. The

General citrus stocks of 1915 seeding, State Nursery, Wahgunyah.

trees that came through the trying ordeal were those which had been worked on the sour orange stock. Mr. Davidson, the district orchard supervisor, informed him that, not only the oranges worked on the sour orange stock, but also the lemons on the same stock, unquestionably came off the best. The stock had an exceptionally good root system, but certainly the trees worked on it required, if not planted out in a very fertile soil, that they should be heavily fed with manures and the soil properly managed. The lemon stock grows rapidly, and was a good forager, so that in poor soils trees on this stock had the advantage and should be given preference to. In addition, they came into bearing early, so that settlers were assured of comparatively quick returns.

The 2,000 seedling lemon stocks now under process of budding were only planted out from seed last spring, so that one could readily understand the popularity this stock obtained with nurserymen.

The sour orange stock block, which consisted of about 25,000, was being budded with buds obtained principally from Mildura, and, as

far as practicable, the buds were taken from trees of good behaviour, both as regards quality of fruit and bearing habit.

He hoped to be able to have trees from Wahgunyah ready for the growers in the spring of 1917, and thence onwards an increasing supply sufficient to meet the requirements of the State.

Mr. D. B. Smith (Chairman of the Vinegrowers' Progress Committee) stated that he wished Mr. Richardson to convey to the Hon. the Minister the best thanks of the growers for the work that was being carried out in the interest of the growers, and for the general development of the viticultural and citrus fruit industries of the State. From what they had seen that day it was evident that the experts of the Department were working on sound lines, and the growers were well

Rough lemon stock budded; seed sown, September, 1915, State Nursery, Wahgunyah.

satisfied with having such capable men watching the general interests of viticulture. He wished to thank Mr. Adcock for having arranged for the inspection, and Mr. Adcock had proved to be the right man for the position of principal of the college. Their friend, Mr. de Castella, never missed an opportunity to promote the interests of the industry, and the advice that he had given, from time to time, to growers had been appreciated. In Mr. Wilkinson, the vineyard manager, they had a practical man who was closely interested in his work. Mr. Carmody was not so well known to the growers, but the results of his work bespoke of its value.

The Hon. J. Bowser, M.L.A., stated that he was delighted to have the opportunity of viewing the work being carried out by the Department. The nursery was a credit to the officers, and it was a pity that

more members of Parliament did not visit it and view the fine work that the Department was carrying out to have the vineyards of the State reconstituted, and to give the people good citrus trees—true to name.

A vote of thanks to the Department was then carried with applause.

In responding to a vote of thanks to the Department of Agriculture, Mr. A. E. V. Richardson, M.A., B.Sc. (Agricultural Superintendent), said that the number of grafted and ungrafted resistant stock applied for during the past three years averaged 1,000,000 per annum, of which, approximately, 700,000 were for grafted rootlings, and 300,000 for ungrafted rootlings. Three years ago, the Department could supply only one vine for every five applied for. The limiting factor hitherto controlling the output was the limited supplies of mother wood. During the past three years, therefore, special attention had been focussed on augmenting supplies of mother wood. A 20-acre vineyard at Violet

Sour orange stock ready for budding; seed sown, October, 1914, State Nursery, Wahgunyah.

Town was taken over by the Department and grafted with mother stocks; the area at Chateau Tahbilk was extended and placed under irrigation; a new 30-acre vineyard of resistant wood was planted in 1914 at the Viticultural College, and extensions had been made in the mother-stock area at Wahgunyah. To cope with the increasing output the nursery area was doubled, and a powerful pumping plant installed. The result of these extensions would mean that the demand would be rapidly overtaken. In the nursery, 500,000 ungrafted rootlings and 220,000 grafted rootlings had been planted during the past year, and, in view of the favorable "strike," the College expected to distribute a total of 500,000 grafted and ungrafted. That is to say, they were now supplying one vine for every two ordered. Within the next two years it was probable that every applicant would be supplied with his full quota of vines. If

the present demand could be fully met, it would mean that reconstitution would be proceeding at the rate of 2,000 acres per annum. But there was no reason why the demand for resistant stock should not increase beyond a million per annum. The prospects of the viticulture industry had never been brighter. Reconstitution had now passed the experimental stage, and had become an acknowledged success. Australian wines were at last coming into their own, and there was an almost unlimited demand in the markets of the world for good Australian wines at highly profitable prices. Under these circumstances it was eminently desirable that the viticultural industry should expand, and expand rapidly, and the Department was determined to keep pace with the enterprise of the vignerons, and accelerate the output of resistant stock until the full requirements of the industry were met. During the past two years a citrus nursery had been established at Wahgunyah. Twenty-two thousand trees were being budded this autumn with Washington navel oranges, and other varieties, and these would be distributed next year at reasonable prices to settlers and others who intended to take up citrus culture. Many difficulties had to be overcome at the outset, but, thanks to the enterprise of Mr. Carmody, they had now largely been surmounted, and from now on there would be a steadily increasing output of trees to supply the needs of settlers. Mr. Richardson said that he would convey to the Minister and Director the vote of thanks passed by the growers, and he was sure that the Minister would be gratified to learn that the growers were fully satisfied with the work that had been done at the nursery, and that they had no requests to make. The success of the work at Wahgunyah was due to the enthusiastic co-operation of those directly responsible for the work, namely, Messrs. Adcock, de Castella, and Carmody, and particularly to the vineyard manager, Mr. Wilkinson, who showed in every detail of his work the touch of the master hand.

This concluded the business of the afternoon, and those present turned homeward, well satisfied that they had spent a pleasant and very interesting afternoon.

COMPOSITION OF FROZEN ORANGES AND LEMONS.

The principal changes caused in citrus fruits by freezing is an excessive loss of moisture. This is shown by a marked lowering of specific gravity. The percentages of sugar and acid decrease slightly but definitely.

Since the change in the composition of the juice is slight, the edible qualities are not impaired if the fruit is not frozen so severely as to cause it to dry up.—H. D. Young, in *Journal of Ind. and Eng. Chem.*, December, 1915.

GOVERNMENT CERTIFICATION OF STALLIONS.

NINTH ANNUAL REPORT (SEASON 1915) ON THE VETERINARY EXAMINATION OF STALLIONS FOR GOVERNMENT CERTIFICATE OF SOUNDNESS AND APPROVAL.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

The ninth year of the examination of stallions for Government certification has been brought to a satisfactory conclusion, notwithstanding the many difficulties which were encountered, which originated from the depletion of the veterinary staff by the exigencies of the European war. Only one member of the staff was unable to "fall in" behind the flag, to the honour of which Australia has so liberally subscribed.

Fortunately, we were able to add one officer to our staff, in the person of Mr. W. M. Lerew, G.M.V.C., who has had considerable experience as a practitioner in the Hamilton district, and who had been unable to volunteer for active service. By the courtesy of the Defence Department, we were, in addition, enabled to call upon the services of Lieut.-Colonel E. A. Kendall and Captain R. N. Johnstone for a limited period, such officers not having left our shores.

Finally, by requisitioning the service of Mr. W. J. Cother, Chief Inspector of Stock, who had previously been attached to the veterinary staff, we were able to fulfil all engagements, which had—in anticipation of difficulties to be encountered—been considerably curtailed, and here I would like to express my thanks to those agricultural societies who, in response to a circular letter pointing out the difficulties of the situation, arranged in some cases for amalgamation with adjacent societies or for strict adherence to the time-table, and in others, where no horses were coming forward, for abandonment of the parade. In this way we were enabled to get through the season by conducting 96 parades instead of 143 as in the previous year.

ARRANGEMENTS FOR COMING SEASON.

For the coming season even greater difficulties are to be encountered, for we will be unable to rely upon the Defence Department for assistance, the officers concerned having either left or about to leave for service abroad, whilst Mr. Lerew is engaged in the work of purchasing remounts. It is possible the latter officer will be available when the parades commence, but in order to keep appointments as far as possible a time-table has been arranged on the basis of one officer only being available. In order to get through with the examination before the shows and mating season, this will necessitate a slight curtailment on last year's operations, and in some cases the distance between places at which parades are arranged will be extended. Some owners will probably require to travel their stallions a greater distance than in the past, but it is hoped that the difficulties will be appreciated; and that consideration which has been shown in the past will be extended over the coming

season. In many cases the examination will be conducted while the train waits at the station, and secretaries of agricultural societies will greatly assist by making the necessary arrangements and so conserve the time of the veterinary officer.

It is possible that the arrangements, as shown in the time-table published, will require considerable amendment when the Railway Department issue their winter time-table, therefore owners of stallions will find it advantageous to arrange to submit their stallions at parades arranged for in main lines as far as possible in order to avoid disappointment should it be found impossible for an officer to attend on branch lines as now proposed.

At the 96 parades held last season, 355 horses were submitted for examination, and the action taken by the individual officers concerned in the examination is shown in the following table:—

Officer.	Number Examined.	Number Certificated.	Number Rejected.	Per cent. Rejected.
Mr. E. A. Kendall, B.V.Sc.	6	6		..
Mr. R. Griffin, M.R.C.V.S.	123	74	49	39·83
Mr. R. N. Johnstone, B.V.Sc. ..	100	60	40	40·00
Mr. W. M. Lerew, G.M.V.C. ...	101	64	37	36·63
Mr. W. J. Cother, G.M.V.C. ...	20	15	5	25·00
Appeal Boards	5	1	4	80·00
Totals	355	220	135	38·03

EXAMINATIONS AND REJECTIONS.

The total number of stallions examined, viz., 355, was a considerable reduction on that of the previous year, when 603 were submitted. A large proportion of this difference was probably due to the restricted number of parades and abandonment of country shows, owners preferring to let the examination stand over until normal conditions are resumed, though restricted importations were accountable for a considerable number, as the following table shows:—

IMPORTS OF HORSES FROM GREAT BRITAIN AND NEW ZEALAND.

HORSES FROM GREAT BRITAIN.

Year.	Shires.	Clydesdales.	Thoroughbreds.	Other.	Total.
1910–11 ..	51	4	65	14	134
1911–12 ..	67	38	39	27	171
1912–13 ..	7	3	62	3	75
1913–14 ..	2	7	21	7	37
1914–15 ..	..	..	49	1	50

FROM NEW ZEALAND.

Year.	Draught Horses.				Light Horses.				Grand Total.
	Stallions.	Mares.	Geldings.	Total.	Stallions.	Mares.	Geldings.	Total.	
1910–11	292	1,786	758	2,836	11	16	10	37	2,873
1911–12	246	452	208	906	12	35	14	61	967
1912–13	173	113	40	326	4	19	9	32	353
1913–14	125	51	6	182	5	9	6	20	202
1914–15	48	51	..	99	2	..	5	7	106

Of the number examined, 135, or 38.03 per cent., were rejected. As in previous years sidebone, amongst the unsoundnesses, was responsible for the greatest number of rejections in draught horses, viz., 39, or 16.32 per cent., or 10.98 per cent. of the total number examined: this percentage is higher than has been noted during the past four seasons, and is probably due to the fact that a much smaller number of individuals has been dealt with, it being always found that the percentage is higher as the total diminishes. An example is shown in the unsoundness curb, where 2.82 per cent. of light horses were affected, whilst to the total number only .84 per cent. were rejected on this account. The number of rejections on the grounds of being below reasonable standard also shows a slight increase, and the same reason may be applied here.

The subjoined table shows an analysis of the examination for the season:—

ANALYSIS OF DEFECTS OF REJECTS, SEASON 1915–16.

—	Draughts.		Lights.		Ponies.		Totals.	
	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	239	144	71	48	45	28	355	220
	Rejected.	Per cent. Rejects.	Rejected.	Per cent. Rejects.	Rejected.	Per cent. Rejects.	Rejected.	Per cent. Rejects.
Unsoundness.								
Bog Spavin		...	...		...	...	...	...
Bone Spavin	1	·42	3	4·22	.	...	4	1·13
Cataract ...	...	...	...	...	...	...	...	...
Chorea (shivering)	1	·42	...	...	...	...	1	·28
Curb ...	...	...	2	2·82	1	2·22	3	·84
Navicular Disease	...	...	...	...	...	...	...	...
Nasal Disease	...	...	...	...	...	...		...
Ringbone ...	1	·42	...		...	...	1	·28
Roaring ...	4	1·67	...	...	...	...	4	1·13
Sidebone ...	39	16·32		...	...	...	39	10·98
Stringhalt ..	...	...	...		...	...	.	...
Thoroughpin		.	...	...	...	...	.	...
Whistling ...	1	·42	...	...	...	...	1	·28
Total unsoundnesses ...	47	19·67	5	7·04	1	2·22	53	14·93
Disapproved	48	20·08	18	25·35	16	35·55	82	23·10
Total rejected	95	39·75	23	32·39	17	37·77	135	38·03

RE-EXAMINATION.

During the season 1914, 267 stallions, 4 years old and under, were given season certificates; of this number only 161 were presented for re-examination as shown hereunder:—

HORSES SUBMITTED FOR RENEWAL OF CERTIFICATES, 1915-1916.

Reasons for Rejection.	3 years.		4 years.		5 years.		Totals.	
	Examined. 8	Certificated. 6	Examined. 52	Certificated. 40	Examined. 101	Certificated. 69	Examined. 161	Certificated. 115
	Rejected.	Per cent. Rejects.	Rejected.	Per cent. Rejects.	Rejected.	Per cent. Rejects.	Rejected.	Per cent. Rejects.
Disapproval	1	12·50	5	9·61	14	13·86	20	12·42
Sidebone ..	1	12·50	5	9·61	14	13·86	20	12·42
Curb ..	..	..	1	1·92	..	..	1	·62
Spavin ..	..	..	1	1·92	..	..	1	·62
Roaring ..	..	..	..	..	3	2·97	3	1·86
Whistling	..	..	..	..	1	·99	1	·62
Total rejections	2	25·00	12	23·07	32	31·68	46	28·57

2 year olds Certificated 1914–15 ..	16	Presented for re-examination 1915–16 ..	8
3 ,, ,, ,, ,, ..	125	,, ,, ,, ,, ..	52
4 ,, ,, ,, ,, ..	126	,, ,, ,, ,, ..	101
Total	267	Total	161

It would appear from these tables that a number of 2 and 3 year olds in 1914 were put out of use for stud purposes. In 1915 only 25 of the 4 year olds failed to be presented for life certificates.

TRANSFERRED CERTIFICATES.

The number of certificates presented for transfer for Victorian Government certificates is as follows:—

New Zealand	14
New South Wales	1
South Australia	1
Total	16

In addition to the above, two certificates issued in other States were indorsed for recognition at Victorian shows. These were as follows:—

New South Wales	1
Tasmania	1
Total	2

APPEALS.

The number of appeals lodged against rejection by Government officers was five, three being on the question of disapproval and two as regards unsoundness. The boards appointed to deal wtih these cases upheld the action of the veterinary officers in four of the cases, and recommended the issue of a certificate in the fifth.

LEGAL PROCEEDINGS.

A case of more than usual interest to stallion owners occupied the attention of the Courts during the season. A stallion owner, being charged at the Lancefield Court with having forged a paper, purporting to be a certificate of soundness and approval, issued to a draught stallion, defendant was committed for trial. The following extract from the *Australasian* of 19th February, 1916, reports the interesting features of the case:—"The trial in Melbourne last week of a horse owner on a charge of forgery is of particular interest to farmers. As far back as 1907 a Government certificate of soundness was obtained for a horse, which has since died. The owner of the certificate subsequently made extensive alterations to it, which covered the name, place of parade, and date on which the certificate was issued, and thus purported to apply to another horse. The defendant pleaded guilty, and was bound over to come up for sentence when called upon. Inasmuch as these certificates of soundness are intended primarily to safeguard the interests of owners of mares, the detection of the forgery will serve to give a feeling of greater security, and furthermore a knowledge that conviction of an offence of this kind is in future likely to be punished by fine or imprisonment, or both, to any amount or extent, may serve to prevent any repetition of the offence."

SUMMARY OF NINE YEARS' WORK, 1907–1915.

Season.	Draughts.					Lights.					Ponies.					Totals.				
	Examined.	Certificated.	Rejected.		Percentage.	Examined.	Certificated.	Rejected.		Percentage.	Examined.	Certificated.	Rejected.		Percentage.	Examined.	Certificated.	Rejected.		Percentage.
1907–8 ..	403	271	Unsound	96	23·82	301	246	Unsound	32	10·63	214	186	Unsound	10	4·67	918	703	Unsound ..	138	15·04
			Disapproved	36	8·93			Disapproved	23	7·64			Disapproved	18	8·41			Disapproved	77	8·38
				132	32·75				55	18·27				28	13·08				215	23·42
1908–9 ..	501	341	Unsound	137	27·33	295	242	Unsound	29	9·83	199	159	Unsound	5	2·5	995	742	Unsound ..	171	17·17
			Disapproved	23	4·59			Disapproved	24	8·13			Disapproved	35	17·58			Disapproved	82	8·24
				160	31·92				53	17·96				40	20·10				253	25·41
1909–10 ..	410	275	Unsound	96	23·52	191	147	Unsound	12	6·27	156	112	Unsound	5	3·29	757	534	Unsound ..	113	15·04
			Disapproved	39	9·56			Disapproved	32	16·77			Disapproved	39	25·65			Disapproved	110	14·65
				135	33·08				44	23·04				44	28·94				223	29·69
1910–11 ..	542	337	Unsound	117	21·57	143	108	Unsound	15	10·53	128	101	Unsound	7	5·47	813	596	Unsound ..	139	17·09
			Disapproved	38	7·01			Disapproved	20	14·08			Disapproved	20	15·62			Disapproved	78	9·6
				155	28·58				35	24·61				27	21·09				217	26·69
1911–12 .	692	554	Unsound	84	12·13	165	120	Unsound	13	7·87	122	83	Unsound	5	4·09	979	758	Unsound ..	102	10·42
			Disapproved	54	7·8			Disapproved	31	18·78			Disapproved	34	27·86			Disapproved	119	12·15
				138	19·94				44	26·66				39	31·96				221	22·57
1912–13 ..	745	597	Unsound	89	12·03	139	106	Unsound	19	13·67	70	43	Unsound	2	2·85	954	746	Unsound ..	110	11·59
			Disapproved	59	7·92			Disapproved	14	10·07			Disapproved	25	35·71			Disapproved	98	10·27
				148	19·73				33	23·74				27	38·57				208	21·81
1913–14 ..	718	507	Unsound	79	11·0	157	102	Unsound	16	10·19	88	60	Unsound	5	5·68	963	669	Unsound	100	10·38
			Disapproved	132	18·38			Disapproved	39	24·84			Disapproved	23	26·14			Disapproved	194	20·14
				211	29·39				55	35·03				28	31·82				294	30·53
1914–15 ..	400	267	Unsound	62	15·50	121	75	Unsound	14	11·57	82	55	Unsound	7	8·53	603	397	Unsound ..	83	13·76
			Disapproved	71	17.75			Disapproved	32	26·44			Disapproved	20	24·39			Disapproved	123	20·40
				133	33·25				46	38·01				27	32·92				206	34·16
1915–16 ..	239	144	Unsound	47	19·67	71	48	Unsound	5	7·04	45	28	Unsound	1	2·22	355	220	Unsound	53	14·93
			Disapproved	48	20·08			Disapproved	18	25·35			Disapproved	16	35·55			Disapproved	82	23·10
				95	39·75				23	32·39				17	37·77				135	38·03

REGULATIONS

Governing the Examination of Stallions for the Government Certificate of Soundness and Approval.

I.—Examination Parades.

(1) Societies within whose district an Inspection Parade is appointed are required to provide a suitable place for the examinations to be conducted, and to suitably and reasonably advertise the holding of the parade on receipt of notice from the Department of the fixture. The secretary or some member of the committee of the society is required to be in attendance at the appointed time to assist the examining officer in the arrangements for the inspection.

(2) The Parades will be conducted and the Veterinary Officer will attend without expense to Societies other than that involved in advertising and making known the occasion to the public and the stallion owners in the district, and providing the examination ground.

(3) The Examining Officer will attend Inspection Parades held at times and places set out in the official Time Table for the year, and all examinations of stallions for the Government Certificate will be made at such Parades or on some such publicly advertised occasion, *unless* under special circumstances as provided for in clause 5.

(4) In the event of it being found impossible for local reasons to hold the Parade in any district at the time and date set out in the Time Table, notice to that effect—together with suggestions for alternative date and time compatible with the rest of the Time Table—should be given *not later than 1st June,* after which no alteration in the Time Table can be made.

(5) The special examination of stallions for the Government Certificate of Soundness at other than the advertised stallion parades may be arranged for in cases where, through accidental circumstances, the owner has failed to submit the horse at such parade.

Such examinations will only be arranged when the attendance of the Examining Officer will not interfere with the requirements of the Department for his services in other directions.

An owner requesting such special examinations will be required to prepay a fee of £1 1s. for each horse examined; also the railway fare (first class return), and travelling expenses at the rate of 14s. per day, of the visiting officer.

II.—Grounds for Rejection.

(1) Refusal of Certificate on the ground of unsoundness will be made only when, in the opinion of the Examining Officer, the horse is affected at the time of examination with one or more of the following hereditary unsoundnesses, viz.:—

Bog Spavin	Ringbone
Bone Spavin	Roaring
Cataract	Sidebone
Chorea "Shivering" or "Nervy"	Stringhalt
Curb	Thoroughpin
Navicular disease	Whistling
Nasal disease (Osteo-porosis)	

or such other hereditary unsoundness as the Minister may at any time declare. (Blemishes or unsoundness, the result—in the opinion of

the Examining Officer on appearances then presented—of accident, injury, and over-strain or over-work, will not disqualify.)

(2) For the purpose of these regulations the following shall be the definitions of "Ringbone," "Sidebone," and "Curb":—

(*a*) Any exostosis on the antero or lateral aspect of the phalanges below the upper third of the *Os Suffraginis* shall constitute a Ringbone;

(*b*) Any ossification of the lateral cartilage shall constitute a Sidebone;

(*c*) Any circumscribed swelling on the posterior aspect of the hock in the median line and within the limits of the lower third of the hock and the head of the metatarsal bones shall constitute a Curb.

(3) The Certificate will also be refused in the case of animals considered by the Examining Officer to be below a reasonable standard for Government approval, as regards type, conformation, and breeding.

(4) Stallions three or four years old, which are refused a Certificate as regards type, conformation, and breeding may be re-submitted annually until five years old, after which the refusal shall be subject to review under Part V. of these regulations only.

(5) In the case of horses that have been rejected for any reason whatsoever, a notification containing all particulars of identification shall be sent to all Chief Veterinary Officers of the other States of the Commonwealth as early as practicable after such examination has taken place.

III.—CERTIFICATES.

(1) Particulars concerning the identity of the horse—name, breeder, pedigree, age, prior ownership, &c.—must be furnished to the Examining Officer at the time of examination. If deemed necessary in any case the owner may be called upon to furnish a statutory declaration as to the correctness of such particulars.

(2) Certificates will be issued within seven days of the holding of the Parades, and will be forwarded to the owner direct. Secretaries of Societies under whose auspices the Parade is held will be notified which, if any, of the horses submitted for examination obtain their Certificates.

(3) The owners of stallions for which a Certificate is refused will within seven days of such refusal be officially notified of the fact; the reason for such rejection will also be given.

(4) Until the issue of a Certificate, or until the publication of the official list of certificated stallions, the result of the Veterinary examination will not be communicated to any person except as herein provided or under circumstances as follow:—The Examining Officer may, on request on proper occasion, communicate to the owner or his agent—duly authorized in writing to inquire—the result of the examination. In case of refusal of the Certificate the reasons for refusal will not under any circumstances, save in legal proceedings under the direction of the Court, be communicated to any person except the owner or his agent duly authorized in writing. Secretaries of Societies, persons in charge of the horse, grooms or relatives of the owner will not be considered authorized agents for that purpose unless

they deliver to the officer the owner's signed authority to receive the information.

(5) The Victorian Government Certificate of Soundness can only be issued in respect of horses three years old and over, that have been examined by a Victorian Government Veterinary Officer, or horses in respect of which any of the following certificates are produced:—

The Government Certificate of Soundness of any Australian State or New Zealand.

The Veterinary Certificate of the Royal Shire Horse Society (England).

The Veterinary Certificate of Royal Agricultural Society (England).

The Veterinary Certificate of Royal Dublin Society (Ireland).

The Veterinary Certificate of Highland and Agricultural Society (Scotland).

The Veterinary Certificate of Glasgow and West of Scotland Agricultural Society.

The Veterinary Certificate of the Board of Agriculture and Fisheries (England).

The Veterinary Certificate of the Board of Agriculture (Scotland).

Provided that such horses have been examined in accordance with these regulations.

Any horse which has been rejected by the Veterinary Examiners for any of the above certificates will not be eligible for examination for the Victorian Government Certificate of Soundness.

(6) The form of the Victorian Government Certificate of Soundness is as follows:—"G.R.—Department of Agriculture, Victoria, No. . Certificate of Soundness and Approval, issued for the season (*or issued for Life as the case may be*), given in respect of the (*breed*) stallion (*name and description of stallion*) submitted for Government inspection by the owner (*name of owner*) at (*place of examination*) such horse having been found suitable for stud service and free from hereditary unsoundness and defects of conformation predisposing thereto on examination by (*signature of Examining Officer*) Veterinary Officer on the day of 19 .

(Signature).

Chief Veterinary Officer.

Issued by direction of the Minister of Agriculture.

(Signature).

Director of Agriculture."

(7) Two-year-old colts may be submitted for examination and a temporary certificate will be issued in respect of such as pass the examination. Such temporary certificate must not be taken to imply suitability for stud service of approval as regards type, nor is the issue of it intended as an indication of the likelihood of a certificate being issued when submitted for examination at a more mature age.

(8) The season in respect of Government Certificates shall be considered as opening on 1st July. Stallions passing the examination any

time during the three months previous to this date in New Zealand or Australia will be granted a Certificate for the season next following. In respect of stallions examined in Great Britain examinations on or after 1st January will be considered as examinations for the following season.

IV.—Tenure of Certificate.

(1) Certificates issued during the season in respect of horses five years old and over are life certificates; those for three-year-olds and four-year-olds are season certificates only, and such horses must be submitted for re-examination at four and five years before a life certificate will be issued.

(2) The Season certificate issued in respect of any horse must be handed to the Examining Officer at the time of re-examination or forwarded to the Chief Veterinary Officer before a subsequent Season certificate or a Life certificate will be issued.

(3) The Minister retains the right to at any time have a certificated stallion submitted for re-examination, and to withdraw the certificate, in the event of the animal being declared, to his satisfaction, unsound.

V.—Board of Appeal.

(1) Any owner of a stallion who is dissatisfied with the refusal of a Government certificate in respect of his horse may appeal against the decision to the Minister at any time within *thirty* days of the examination, under the following conditions:—

(*a*) That the appeal be in writing and be accompanied by the lodgment of £5, such amount to be forfeited in the event of the appeal *not* being upheld, unless the Board shall for good cause otherwise direct.

(*b*) That the appeal be accompanied by an undertaking to pay any railway fares and hotel expenses incurred by the Board of Appeal in connexion with the settlement of the appeal.

(*c*) That, in the event of refusal having been on the ground of unsoundness, the appeal be accompanied by a certificate from a registered Veterinary Surgeon setting out that the horse has been found by him on examination since the refusal appealed against to be free from all the unsoundnesses set out in Part II. of these regulations.

(*d*) That, in the event of refusal having been on the ground of being below standard for Government approval, the appeal be accompanied by a certificate from the President and two members of the Committee of the Society under whose auspices the parade was held, setting out that in their opinion the horse is of fit and proper type, conformation, and breeding to be approved as a stud horse.

(2) On receipt of Notice of Appeal in proper form, and with the above conditions complied with, the Minister will appoint a Board of Appeal, which shall consist of:—

(*a*) In the case of appeals against refusal of certificate on the ground of unsoundness, the Chief Veterinary Officer and two practising Veterinary Surgeons.

(*b*) In the case of appeals against refusal of certificate as being below standard for Government approval, the Chief Veterinary Officer and two horsemen of repute and standing.

Such Board shall act and decide on the appeal, and its decision shall be final, and *not subject to review.*

(3) In the event of the appeal being allowed, refund shall be made of the deposit and any expenses paid by the appellant under Clause 1 (*b*). Further, the Board may recommend to the Minister the allowance of such of the expenses of the appellant in supporting his appeal as it may consider reasonable under the circumstances of the case, and the Minister may, in his discretion, confirm the recommendation in whole or in part, whereupon allowance shall be made to the appellant accordingly.

(4) No stallion in respect of which a Government certificate is refused will be allowed to be re-submitted for examination except in the case of an appeal or in such case as when a three or four years old stallion has been refused on account of type as herein provided for. In the event of any rejected stallion being re-submitted for examination under another name or under such circumstances as in the opinion of the Minister are calculated to mislead the Examining Officer into the belief that the horse has not previously been examined, the owner of such rejected stallion, if proved to the satisfaction of the Minister that he is responsible for such re-submission, shall be debarred from submitting any horse for examination for such period as the Minister shall determine.

NOTICE TO SECRETARIES OF AGRICULTURAL SOCIETIES.

Section " A " of the conditions to be complied with by Agricultural Societies before being eligible for participation in the annual Government grant is as follows:—

> " *A.—That the awards of prizes in all classes for stallions, three years old and over, at the Society's Show must be subject to the possession by the exhibit of a Government certificate of soundness.*"

In order to comply with the above, the special attention of show secretaries is invited to the receiving of entries in stallion classes. No entry should be received unless at the time of entry the Government certificate is produced, or unless satisfactory evidence is given that a Government certificate is held by the owner in respect of the exhibit. The awarding of a prize card and the withholding of prize money in respect of any exhibit shall not be deemed as compliance with the condition. Care should be taken also to see that the certificate is not out of date, that is to say:—

For three-year-olds, a 1916 three-year-old certificate must be held.

For four-year-olds, a 1916 four-year-old certificate must be held (the 1915 certificates are out of date).

For horses five years old and over, a life certificate must be held.

Horses holding Government certificates issued by any other State are not eligible to compete at shows unless such certificate is endorsed by the Victorian Department, "Recognised for Victorian Shows."

Particular attention is directed to the method now in vogue of classifying certificated stallions. The list is now divided into horses carrying a life certificate and those which are terminable, and supplementary lists will be issued annually which should be added to those listed in Bulletins No. 30, No. 17, No. 24, and No. 30 (New Series).

Secretaries are strongly urged to become familiar with the regulations, particularly Regulation IV., which deals with the tenure of certificates.

Secretaries are required to *forward immediately after the show* a return (forms for which will be sent to each society) giving required particulars concerning 1st, 2nd, and 3rd prize winners as under:—

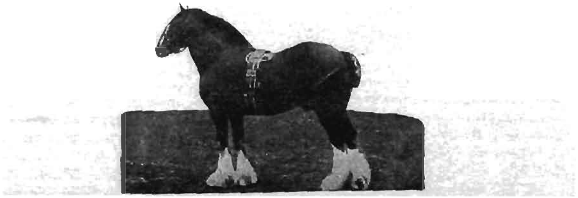
RETURN to be forwarded to the Chief Veterinary Officer concerning Stallions (three years old and over) awarded Prizes at the .... Agricultural Society's Show held ....

Name of Stallion.	Certificate Number.	Name of Class and Section (not Number).	Prize Awarded.			Owner's Name.	Owner's Address.
			1st.	2nd.	3rd.		

(Signed) ....

Secretary .... Agricultural Society.

Date ....



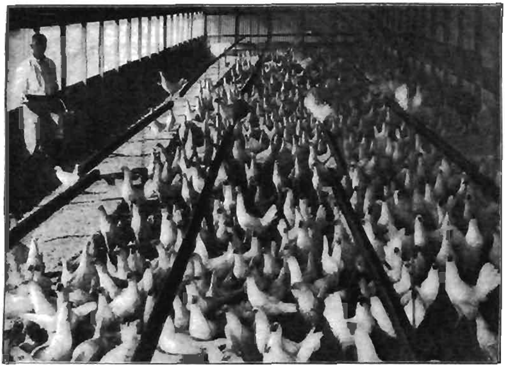
PRACTICAL POULTRY KEEPING.

ADOPT A SYSTEM.

By A. Hart, Chief Poultry Expert.

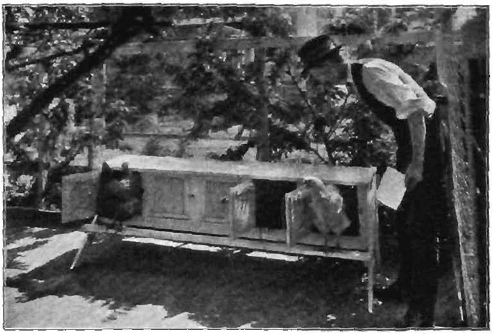
Hints to Beginners.

In these days of keen competition in the poultry-keeping industry everything in connexion with the business must be conducted on up-to-date lines. Money, of course, is the sole object in view of the man who keeps poultry for profit only. But even in his case it is absolutely necessary to select the very best possible strain and feed and care for the birds on up-to-date lines if success is to be obtained. The best stock are the cheapest in the end, and the proved methods of keeping and feeding the birds should be practised by every beginner in the business. In

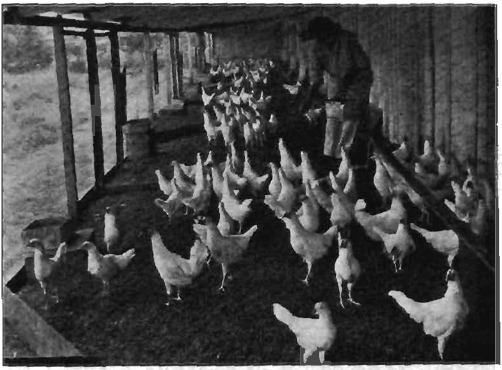


Successful poultry keeping in large flocks.

making a start the beginner must first decide what varieties he will keep. If eggs are desired as the sole source of profit, then White Leghorns should be his selection. But if a combination of egg production and rearing table poultry for market is wanted, then he must select some other breed as well as White Leghorns. We have Orpingtons, Wyandottes, Rhode Island Reds, Plymouth Rocks, Faverolles, and Sussex, which are all useful in the production of general utility or all-round stock. But as eggs are at present the main source of return from poultry in Victoria, I would advise the beginner to select White Leghorns for



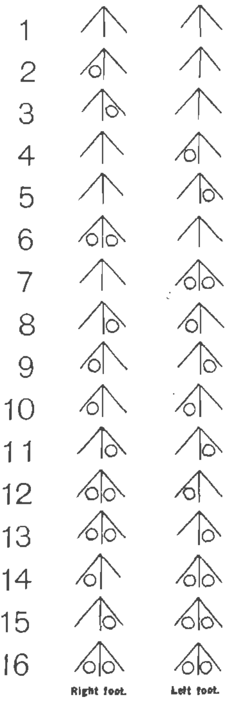
Trap nests. By the use of these nests it is possible to discover the hens that pay and those that do not.



Woman's work. Results obtained during the first year by a successful beginner.

the greater proportion of his flock. The beginner who wishes to improve his stock should start with birds of the very best possible laying strain, procuring cocks or cockerels unrelated and bred from high-grade layers. It is just as necessary to have good laying strains on the male bird's side as it is to have it on the side of the hens. By starting with birds as

described above you have good material to work upon. As the beginner may experience some difficulty in indicating the best layers in his stock, I would advise him to use trapnests. By this method he can pick out his best egg producers with certainty, and by breeding from none but tested layers he can improve the young stock to a marked degree. By adopting the plan of marking your birds with rings you can keep a record of each hen's egg production. Celluloid rings of different colours can be procured, and all that you have to do is to note the colour of the ring as she leaves the nest, and mark the egg accordingly.



Punch marks on feet for identification of the different strains and mating. These marks should be made directly birds leave incubator.

Another point which is essential in breeding strong and vigorous young birds of good constitution is to allow your breeding birds plenty of range. A small pen is not conducive to the production of strong chickens and fertility, and although good stock may be hatched under these conditions better birds still would be produced from the same parents if allowed more room. Animal food is also very useful in procuring good results in hatching, as well as increasing the egg production. But too much is harmful and about ½ an ounce to each bird two or three times a week will generally be sufficient for stock birds. The food given should be fresh, sound, and sweet. The grain should be plump and clean. Wheat is, of course, the staple grain, but oats, peas, and maize are also to be recommended in small quantities. Plenty of green food should be given every day, about noon being the most suitable time to give it. The morning meal should be a warm mash composed of pollard, bran, peameal, and oat pollard moistened with meat soup or warm separated milk or water, working it to a crumbly consistency. Fresh water should be regularly supplied, and the vessels thoroughly cleaned out every day. Plenty of shell grit and charcoal should be provided, and a dust bath is also very necessary, consisting of wood ashes, sand, and sulphur. The roosting house should be kept thoroughly clean, and a sharp lookout made for red mites or other forms of pests which infest poultry. Nest boxes should be kept very clean and well lined

with fresh straw so as to insure the eggs being clean. Eggs do not improve in looks by being washed, and the best method is to keep them clean by having the nests prepared so that they do not become stained or lose the fresh appearance they have when laid.

This pen has been specially mated up to produce prolific layers.

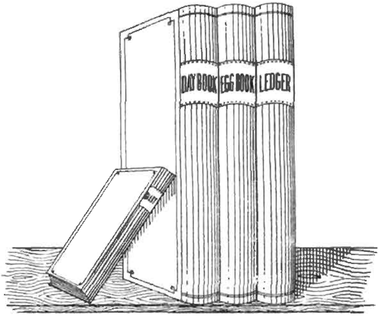
This pen has been specially mated up to produce cockerels to improve the size of the egg.

Adopt a System.

The poultry-keeper who starts in this business and wishes to become a practical man must use a system. Book-keeping is quite as necessary in connexion with profitable poultry-keeping as it is in any other business. A cash-book will indicate the daily receipts and expenditure in

connexion with your fowls. A ledger will show how the businesss stands from month to month, and in connexion with an egg record, will tell you how the stock are producing. A diary will also be very useful for writing down the doings of each day, and must form a very valuable book of reference for the owner of the farm.

It does seem strange that so many poultry-keepers do not keep full and correct accounts of their business. If this system were regularly practised, I venture to say that the poultry industry would be much improved. If poultry-keepers want to know if their stock is paying, if they want to know when a change of breeding birds is necessary, if they want to know anything certain about the business, the only reliable *method is to adopt a system and keep books. Four books will be quite* sufficient. A cash-book, a ledger, an egg-record book, and a diary will be required, and if kept properly the poultry-keeper will certainly admit that the system is well worth the extra trouble entailed.



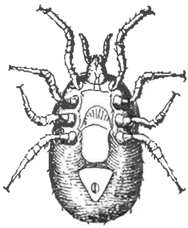
Key to Success.

The cash-book will show you exactly the amount of business you did on every day of the previous year, also the price of the food purchased. The price of buildings, as well as many other items of interest will be in the cash-book for reference, and its value is only known to those who have given it a trial. The ledger will give you full particulars of the receipts and expenditure for the past year, and will show you whether your business has been a success. The egg-record book will indicate with certainty the quantity of eggs produced by birds from the different pens, the time when they commenced laying, the birds which contracted broodiness, and a great deal of other essential information. The diary is one of the most useful books in the set. It is a daily record of all that happens in connexion with the business you are engaged in, showing a complete record of what takes place every day. As a book of reference it is invaluable, and for this reason alone no poultry-keeper should be without a dairy kept on up-to-date lines. The adoption of a system

on the above lines must be especially valuable to all poultry-keepers who take an interest in the business, and it can be termed one of the main stepping stones towards success in this industry.

Red Mite.

One of the most common as well as the most annoying of the parasites that infest the poultry houses and their inmates is what is known as the *red mite.* It is one of the smallest of these pests, but it multiplies so quickly that myriads will be found in a few weeks after it first makes its appearance. Although known as red mite, this parasite is is naturally grey in colour, the reddish tinge to the body being given by the blood it sucks from the fowls it preys upon. The eggs are laid on the fowls themselves, and can often be seen in thousands attached to the feathers. They will also be found in cracks and crevices of the fowl-house or other buildings. The heat of the fowl will encourage the hatching of the eggs which are attached to the feathers, and the approach of warm weather will also act similarly on the eggs that are in sheltered parts of the fowl-house. They quickly attain full size, and at once proceed to annoy the fowls by sucking the blood from them. Although all of them do not always stay on the fowl, it will be found that a good proportion of them do so, the remainder filling themselves with blood and then going back to the roosts or boxes. In the case of chickens the red mite is especially harmful. They infest them in such large numbers that they quickly suck the greater portion of the blood out, and the chicken literally weakens and dies through their ravages. When hens are used for hatching purposes, the red mites will prove a very serious trouble unless strict supervision and certain preventives are used. Sittings of eggs are often spoilt through the red mite, amateur owners not finding out what is the cause until the hen has left her eggs and the chickens are dead in the shells. When chickens are reared in brooders, the red mite is also likely to make its appearance, and if not exterminated, will speedily cause many deaths among the inmates. You may see a number of chickens with the back of their heads and necks slightly bare, their wings drooping, and their general condition indicating that they are full of disease. On examination it will be found that it is the red mites that are causing all the trouble, and with their speedy eradication the chickens will quickly improve and throw off all signs of disease.



Red Mite
(magnified 85 times).

There are several methods of eradicating these pests, but the system of prevention is the best of all cures. By applying the remedies during the winter months you effectively prevent the eggs from hatching, and if this is done properly, the task of keeping the mite down during the summer and autumn months will be comparatively light. The most effective remedy for red mite is spraying or painting the places where the eggs or mites accumulate with kerosene. The spraying is the quickest method, and any ordinary garden spray with a fine nozzle will answer the purpose. Painting with a soft and fairly large brush is also suitable, but

in any case it is absolutely necessary that the whole of the building should receive its share. If any crack or crevice remains untouched, the operation is practically useless. Another remedy is kerosene emulsion. This is made by boiling a gallon of water and adding about a pound of soft soap. Then stir in a quart of kerosene and apply as hot as possible with either a spray or brush. A coating of boiling tar to which a little pitch is added may be used. This will kill the mites and also fill up cracks or crevices. Washing with hot limewash is also a remedy. There are also several forms of insect powder and ointments which are useful in eradicating red mites. Kerosene or emulsion will, however, be found an effective as well as a cheap remedy.

FIELD CROP COMPETITIONS (POTATOES).

By J. T. Ramsay, Potato Expert.

Continuing their efforts to foster the potato-growing industry in their respective districts, the Agricultural Societies of Pakenham, Leongatha, Trafalgar, and Yarragon (the latter two in conjunction), again offered prizes for the best crops for the season 1915-16. For this the societies are to be commended.

Their example might be followed with profitable results by the societies of other districts, not only for potato crops, but for every crop commerically grown. Competition is the soul of business, and it is equally true that competition in crop-growing is the best whip that is possible of application, to induce land-holders to put that interest and applied knowledge into practice. These two things only can raise the average production of their acres and elevate the standard of their operations to a plane worthy of the name of farming.

Such competitions cannot but have an all-round beneficial influence. The leavening of friendly rivalry created by them must of necessity promote effort to increase knowledge of how soils can best be husbanded to increase their productiveness, and how crops can best be treated so that their prolificacy may be augmented. The acquirement of that knowledge, coupled with the desire to eclipse the results obtained by other growers, must develop interest which will find expression in its practical application to the cultivation of crops, with the necessary result that higher all-round yields will obtain than can possibly be secured by what might be termed a *laissez-faire* system of farming.

These being self-evident truths, the societies promoting these competitions deserve every support by the growers in their respective districts. If these growers would only realize that in supporting and making the competition a success they were not merely advertising the society, but advertising the district and their own wares in a most effective manner, there would be no paucity of competitors for the honour of securing the distinction of having produced the best crop of the season.

It may be argued that the growing of a few acres for a competition would not affect the standard of cultivation of the larger areas generally grown commercially. A moment's consideration should be sufficient to prove the fallacy of such argument. The educational benefit derived from the practical demonstration of the increased yield from the small area on which more intense cultural methods were practised would make it obvious that these methods produce returns showing a greater proportionate profit, and would have the effect of causing these improved methods to be applied to the larger areas.

Pressure forced the wheat farmers of Australia to use improved methods of farming in producing their wheat.

Pressure likewise will compel the farmers of other crops to improve their methods. These competitions, if properly availed of by growers, will do much to anticipate this economic pressure, which, although a useful and effective lever for improving the output of any industry, is often an unpleasant experience to those attached thereto.

In judging these crops a maximum of 100 points was divided as follows:—

Evenness of crop	10 points
Cleanliness of crop as regards cultivation and disease	10 ,,
Quality of crop	45 ,,
Weight per acre	35 ,,

In allotting points for weight, the crop scoring highest in that section was given full marks, and the others were given marks pro rata. Some very heavy yields were recorded. In the Pakenham competition, the winner, Mr. J. Savage, had a nice crop estimated to scale 11 tons per acre of marketable tubers. In the Trafalgar and Yarragon competition, Mr. T. Coonerty topped the Carman class with a 17-ton crop. Mr. W. Dowton, in the class for any other variety, had two entries which would yield 14 and 17 tons respectively per acre, but which were, unfortunately for him, disqualified, because his area was not up to the measurement demanded by the conditions of the competition, and the first place was taken by Mr. H. Best, who was next highest in points.

Mr. J. Geale scored heavily in the Leongatha competition with a magnificent crop of 18 tons to the acre.

The quality of the crops, with few exceptions, would have been much improved had the growers adopted the practice of closer planting than is the rule. Land which is capable of growing 15 to 18 tons of potatoes to the acre is rich enough to carry a full crop with planting distanced 2 ft. 3 in. between the rows, and the sets spaced 14 inches or 15 inches in the rows. Planting at those distances, or even less on the richer lands, would have the effect of producing heavier yields of medium sized and better quality tubers. The grower who produces tubers as large as mangolds has his system of planting to blame. He should plant closer, and so restrict the feeding area of the plants. The result would be improvement in size, improvement in quality, and equally heavy, if not a heavier, tonnage In estimating the weights per acre, one row representative of the average of the whole area was selected, and one chain long dug out of it. The result was multiplied by ten times the number of rows planted to one chain width. The only margin of error permitted by this system of calculation is possible in estimating what is a fair average row of the area.

The results of the various competitions are given herewith.

PAKENHAM AGRICULTURAL SOCIETY'S COMPETITION.

Potatoes.

—	Evenness.	Cleanness.	Quality.	Weight.	Total.
	10	10	45	35	100
J. Savage	9	9	38	35	91
M. Sexton	9	10	40	26	85
J. Dixon	9	9	40	26	84
McW. Piper	8	8	43	24	82
McCarthy Bros.	7	7	40	26	80
M. Cunningham	9	9	38	23	79
T. Anderson	6	9	45	19	79
T. Clapperton	7	9	43	18	77
C. G. Reid	7	7	42	16	72
J. B. Reid	8	8	45	10	71
A. S. Reid	8	8	45	9	70
W. A. Reid	8	7	43	7	65

TRAFALGAR AND YARRAGON SOCIETIES' COMPETITIONS.

Potatoes.

CARMAN CLASS.

—	Evenness.	Cleanness.	Quality.	Weight.	Total.
	10	10	45	35	100
T. Coonerty	9	9	40	35	93
W. J. Casey	9	8	42	28	87
J. F. Young	8	8	41	25	82
C. Tucker	8	9	42	23	82
D. L. Young	9	9	40	23	81
H. Best	8	9	42	21	80
G. Mulcahy	8	9	42	18	77
W. A. Tyrrell	9	10	40	17	76
J. A. Briggs	9	8	41	17	75

ANY OTHER VARIETY.

Name.	Variety.	Evenness.	Cleanness.	Quality.	Weight.	Total.
		10	10	45	35	100
W. Dowton ..	Gold Coin ..	8	10	39	35	92
W. Dowton ..	Dates	9	10	41	29	89
H. Best	"	8	10	43	21	82
J. A. Briggs ..	"	9	8	43	21	81
W. J. Casey ..	Cook's Favorite	8	9	40	23	80
D. L. Young ..	" " ..	10	9	40	19	78
C. Tucker	" " ..	8	9	41	18	76

LEONGATHA AGRICULTURAL SOCIETIES' COMPETITION.

Potatoes.

Name of Grower.	Evenness.	Cleanness.	Quality.	Weight.	Total.
	10	10	45	35	100
J. Geale	8	8	43	35	94
N. E. Hayes	8	7	42	14	71
W. M. Hayes	4	4	40	15	63

The result of five crops of one acre of maize for fodder which were entered for a prize given by the Trafalgar and Yarragon Societies is also given here.

The winner of this, Mr. C. Tucker, had an exceptional crop of beautiful quality Hickory King maize, which did him great credit, and which was estimated (by the same means used in arriving at the weights of the potato crops) to yield 40 tons per acre of succulent green maize.

MAIZE.

Name.	Cultivation.	Method of Sowing.	Quality.	Yield.	Cleanness.	Freedom from Disease.	Total.
C. Tucker	9	10	18	40	9	10	96
H. Matthews ..	8	10	17	33	9	10	87
M. O'Brien ..	8	8	17	30	8	10	81
R. S. Young ..	10	10	13	28	9	10	80
A. Cuthbert ..	7	6	14	25	8	10	70

STANDARD TEST COWS.

QUARTERLY REPORT FOR PERIOD ENDED 31st MARCH, 1916.

During the period 50 cows completed their term under the regulations. Of this number 38 qualified for their certificate.

Individual returns are as follows:—

Mrs. A. BLACK, Noorat. (Jersey.)

Completed since last report, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Madge	3575	27.5.15	3.6.15	273	12	4,624½	5·04	233·04	200	265¾

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll.)

Completed since last report, 16. Certificated, 14.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Connecticut ..	Not yet allotted	3.4.15	10.4.15	273	21	7,204½	4·75	342·36	250	390½
Panama	,,	12.4.15	19.4.15	273	17	5,869	4·23	248·45	200	283¼
Vuelta	,,	25.4.15	2.5.15	273	20	8,311½	4·03	334·89	250	381¾
Phillipina ..	,,	26.4.15	3.5.15	273	19	7,122½	4·82	343·13	250	391¼
Primrose League (imp.)	,,	10.5.15	17.5.15	273	19¼	6,831	4·34	296·27	..	337¾
Alpina	,,	13.5.15	20.5.15	273	15½	6,357	4·00	254·23	250	289¾
Turka	,,	16.5.15	23.5.15	273	32½	6,362¾	4·96	315·92	250	360¼
Cameo	,,	23.5.15	30.5.15	273	15½	5,873¼	4·72	277·32	250	316¼
Sumatra	,,	24.5.15	31.5.15	273	20	7,494½	4·40	329·71	250	375¾
Tennessee ..	,,	26.5.15	2.6.15	273	14½	5,075½	4·09	207·77	200	236¾
Mexicana ..	,,	1.6.15	8.6.15	273	16	7,969	4·39	349·54	250	398¼
Asiana	,,	5.6.15	12.6.15	273	12½	6,367	4·63	295·00	250	336¼
Samorna ..	,,	12.6.15	19.6.15	273	10½	5,400¼	4·71	254·68	200	290¼
Netherlana ..	,,	22.6.15	29.6.15	273	28	9,455½	4·25	402·03	250	458¼

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire.)

Completed since last report, 9. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Gipsy Maid of Glen Elgin	1818	2.4.15	9.4.15	273	8½	6,180	4·27	264·09	250	301
Ruby of Glen Elgin	1836	6.5.15	13.5.15	273	19	8,538	4·13	352·98	250	402¼
Ruby of Sparrovale	2512	18.6.15	25.6.15	273	7½	7,178	4·37	313·42	200	357½

T. HARVEY, Boisdale. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Sparkle	2978	20.4.15	6.5.15	273	15	5,091	6·37	324·45	200	369¾

A. W. JONES, Whittington. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lady Grey V. ..	3756	8.6.15	15.6.15	273	32	8,646½	5·05	436·07	250	498¼

C. G. KNIGHT, Cobram. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Romany Lass ..	2563	18.5.15	25.5.15	273	11½	5,032¼	5·63	283·50	200	323¼
Amy Castles ..	1520	31.5.15	7.6.15	273	11	5,542	5·29	293·16	250	334¼

C. D. LLOYD, Caulfield. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Doreen	2976	6.5.15	13.5.15	273	8½	5,238	5·13	268·93	200	306½

C. G. LYON, Heidelberg. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Hawthorn II. of Banyule	3619	1.4.15	8.4.15	273	8	5,451	5·63	307·01	200	350
Velveteen II. ..	2927	2.4.15	*5.5.15	273	23	8.361	4·59	383·95	200	437¾

* Entry deferred, as no weights available.

J. D. READ, Springhurst. (Jersey.)

Completed since last report, 10. Certificated, 9.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Princess of Springhurst	2521	4.4.15	11.4.15	273	8½	5,869	6·05	355·28	250	405
Tulip of Springhurst	2730	10.4.15	17.4.15	273	11	5,735	5·59	320·89	250	365¾
Stockings of Springhurst	2663	23.4.15	30.4.15	259	9	5,464	5·05	275·84	250	314½
Euroa of Springhurst	1918	26.4.15	3.5.15	273	5	4,969½	5·54	275·57	250	314¼
Graceful Magnet of Springhurst	2058	3.5.15	10.5.15	273	13	6,392	5·37	343·05	250	391
Alsyke of Springhurst	1515	10 6.15	17.6.15	273	8	5,724	5·26	301·07	250	343¼
Daisy of Springhurst	1788	14.6.15	21.6.15	273	9½	5,673	5·23	296·56	250	338
Grannie of Springhurst	2059	14.6.15	21.6.15	273	5	5,385½	5·23	281·65	250	321
Hyacinth ..	3705	22.6.15	29.6.15	273	9	3,713	5·89	218·74	200	249¼

D. SADLER, Camperdown. (Ayrshire.)

Completed since last report, 2. Certificated, 0.

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Laura VI. of Melrose	3658	5.4.15	12.4.15	273	14	7,172	5·80	416·36	250	474¾
Jessie's Progress ..	3657	16.4.15	23.4.15	273	18½	7,784½	5·96	464·28	250	529¼
Pearl III. of Melrose	Not yet allotted	20.4.15	27.4.15	273	9	4 016½	6·49	260·62	175	297
Lady Melrose IV. ..	,,	27.4.15	4.5.15	273	18½	7,336	4·92	360·99	200	411½

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917.

Commenced 15th April, 1916; concluding 14th April, 1917.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.5.16	Position in Competition.
		LIGHT BREEDS.		
		WET MASH.		
13	*H. J. Meddows*	*White Leghorns* ..	122	1
11	R. W. Pope ..	,, ..	121	2
17	W. G. Swift	,, .	120	3
27	John Blacker .	,, ..	116	4
38	V. Little	,, ..	115	
40	A. Brundrett	,, ..	115	5
16	F. Collings	,, ..	115	
15	G. Laughlan	,, ..	113	8
36	E. W. Hippe	,, .	113	
1	G. McDonnell	,, .	111	10
3	W. M. Bayles	,, ..	110	11
12	*G. Harman* ..	,, .	109	12
41	Excelsior Poultry Farm ..	,, ..	108	13
7	C. J. Jackson	,, .	108	
34	F. G. Silbereisen	,, ..	105	15
26	Mrs. A. Dumas	,, ..	104	16
25	A. H. Mould	,, ..	104	
18	C. Ludwig	,, .	103	18
37	J. M. Smith	,, .	103	
5	W. G. Osburne	,, ..	101	20
6	J. J. West .. .	,, .	101	
23	T. A. Pettigrove ..	,, ..	93	22
20	H. Merrick	,, ..	93	
45	C. H. Oliver	,, .	83	
28	S. Cheatle .. .	R.C.B. Leghorns .	83	24
22	Mrs. H. Stevenson ..	White Leghorns ..	83	
24	H. N. H. Mirams .	,, ..	79	27
30	F. T. Denner .. .	,,	79	
21	A. E. Payne	,, ..	74	29
44	J. Jamieson	,, ..	71	30
43	S. Buscumb	,, ..	70	31
2	H. McKenzie and Son ..	,, ..	69	32
42	Thirkell and Smith ..	,, ..	68	33
19	Benwerren Egg Farm ..	,, ..	65	34
14	W. B. Hustler	,, ..	65	
9	W. H. Clingin	,, ..	59	36
33	E. M. Evans	,, ..	54	37
8	E. A. Lawson	,, ..	52	38
29	A. S. Hyndman ..	,, ..	50	39
32	N. Burston	,, ..	44	40
10	J. H. Duncan	,, ..	44	
31	J. H. Gill	,, ..	32	42
101	A. E. Silbereisen ..	,, ..	15	43
39	L. McLean	,, ..	12	44
4	Fulham Park	,, ..	5	45
35	Tom Fisher	,, ..	5	46
		Total ..	3,764	
		HEAVY BREEDS.		
		DRY MASH.		
97	D. Fisher	Black Orpingtons ..	95	1
98	Marville, P. F.	,, ..	78	2
95	Mrs. Pearce	,, ..	70	3
100	Oaklands Poultry Farm ..	,, ..	68	4
94	Mrs. Coad	,, ..	30	5
99	J. Ogden	,, ..	3	6
96	H. Hunt	,, ..	..	7
		Total ..	344	

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916–1917—*continued.*

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.5.16.	Position in Competition.
	LIGHT BREEDS			
	DRY MASH.			
46	W. H. Robbins ..	White Leghorns ..	140	1
59	T. A. Pettigrove ..	,, ..	134	2
52	W. J. Thom ..	,, ..	128	} 3
61	C. C. Dunn ..	,, ..	128	
55	Rev. J. Mayo ..	,, ..	119	} 5
65	Izard and Tierney ..	,, ..	119	
53	W. N. O'Mullane ..	,, ..	115	7
70	G. Wilkinson ..	,, ..	113	8
64	A. Bennet ..	,, ..	110	9
54	Mrs. Hughes ..	,, ..	108	10
58	C. Ludwig ..	,, ..	105	11
56	Mrs. Nicoll ..	,, ..	104	12
62	J. W. Morrow ..	,, ..	103	13
48	Thirkell and Smith ..	,, ..	95	14
69	E. A. Lawson ..	,, ..	91	15
47	H. McKenzie and Son ..	,, ..	83	16
49	C. Lane ..	,, ..	81	17
51	Reliable Poultry Farm ..	,, ..	80	18
60	A. Greenhalgh ..	,, ..	77	19
67	Lysbeth Poultry Farm ..	,, ..	60	20
50	Clevedon Poultry Farm ..	,, ..	57	21
57	H. J. Brown ..	,, ..	46	22
68	W. G. Osburne ..	,, ..	20	23
66	Benwerien Egg Farm ..	,, ..	15	24
63	N. Burston ..	,, ..	..	25
		Total ..	2,231	
	HEAVY BREEDS			
	WET MASH.			
72	Marville Poultry Farm ..	Black Orpingtons ..	141	1
74	Oaklands Poultry Farm ..	,, ..	140	2
89	Brooklyn Poultry Farm ..	,, ..	136	3
87	S. Buscumb ..	,, ..	119	4
86	C. Ludwig ..	,, ..	118	5
80	Mrs. Pearce ..	,, ..	104	6
85	Mrs. M. Coad ..	,, ..	91	7
79	Stranks Bros. ..	White Orpingtons	90	8
81	K. Courtenay ..	Faverolles ..	87	9
83	L. McLean ..	Black Orpingtons ..	69	10
92	J. H. Wright ..	,, ..	60	} 11
88	A. D. McLean ..	,, ..	60	
77	Mrs. G. R. Bald ..	White Plymouth Rocks	56	13
93	L. W. Parker ..	Black Orpingtons ..	49	14
73	E. W. Hippe ..	Rhode Island Reds	40	} 15
90	Excelsior Poultry Farm ..	Black Orpingtons ..	40	
91	N. Papayanni ..	,, ..	36	17
78	Reliable Poultry Farm ..	,, ..	33	18
75	Mrs. Drake ..	Rhode Island Reds	32	19
84	H. L. Trevana ..	,, ..	30	20
76	L. A. Errey ..	Silver Wyandottes	18	21
82	J. Ogden ..	Black Orpingtons ..	3	22
71	C. E. Graham ..	,, ..	..	23
		Total ..	1,552	

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

MONTHLY REPORT.

The weather during the past month was mild and warm for time of year, consequently the new birds settled down and commenced laying better than usual. The yield of eggs for the month has been very satisfactory. A few birds have gone into partial moult, and others went off after arrival, whilst two birds have gone broody. Temperatures: highest, 82 deg. Fahr.; lowest, 45 deg. Fahr. Rainfall, 229 points.

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne, Victoria.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

PLANTING.

The time has now arrived when the general planting of deciduous fruit trees will take place. The soil should have previously been well ploughed and subsoiled, and, as far as possible, drained. Certainly to insure satisfactory results, the orchard must be subsoiled. Where expense is a consideration, drainage may be left for subsequent years, but once the orchard has been planted, it will be impossible to subsoil.

When planting out, the distance between the trees will be determined by the kinds to be planted. For ordinary deciduous fruiting trees it is the custom in this State to plant them 20 feet apart in the rows, the rows also being 20 feet apart. Results have proved this to be a satisfactory practice. Almond trees may be planted 15 or 16 feet apart each way, while walnuts, owing to their spreading habit, require a distance of 30 feet apart each way.

Deep planting is not advocated, the general practice being that the depth of planting in the nursery should be followed. If holes are dug, they should be shallow, the bottom being merely loosened to allow a comfortable friable bed for the tree roots. A good practice is to dig the whole strip along which the trees are to be planted, merely removing sufficient soil afterwards when planting. Another satisfactory custom is to plough furrows 20 feet apart, and to plant the trees in the furrows, filling in the soil over the roots and trampling well down.

Before planting, the roots of the young trees should be well trimmed, shaped to an even form, and cleanly cut. As the result of their removal from the nursery beds, the roots are generally more or less damaged, and numbers of the fibrous roots, becoming dry, shrivel and die. These all require a clean trimming. Then it is often desirable to remove some of the roots so as to balance the root system. The trimming of the roots gives the young tree a clean root system, and it is enabled to establish itself with young, vigorous roots.

After planting, the top should be well cut back, so as to leave three or four arms, with three or four buds on each. Where it is not possible

to have this number of arms or limbs it is frequently advisable to cut back to one stem, allowing the buds to break out strongly and frame the tree after planting. In some localities, the custom of not cutting back the trees the first year is favoured. Local experience has not resulted in favour of this practice, as it is found to be inadvisable to unduly strain the young tree by leaving a heavy top to be supported by the weak-growing root system.

A number of good commercial fruits have been found to be either wholly or partially self-sterile, requiring other varieties near them to enable them to set their fruit. For this purpose it is necessary that the bloom periods should be somewhat coincident.

SPRAYING.

The dry season has been favorable, in many districts, to the increase of certain scale insects, woolly aphis, and the bryobia mite. The use of red oil has been advocated for these pests, and, as well, crude petroleum, kerosene and other oil emulsions have proved satisfactory. Some years ago the use of lime, sulphur and salt spray was much in vogue as a winter spray. Owing, however, to the difficulty of preparing the spray, and to its caustic effect on the skin, it was practically abandoned as an insecticide. Even then it was claimed, and rightly so, that the spray was, to a certain extent, a very good fungicide. The use of this mixture as a winter wash, with the omission of the salt, which has been found to be an unnecessary ingredient, is now general; and, as it is obtainable in a ready-made form, it is to be strongly recommended as a good all round winter spray.

GENERAL WORK.

All ploughing should now be completed; if not, it should be finished before spraying and pruning operations are proceeded with.

Any autumn manuring or liming should also be now carried out. This, too, should be finished before spraying or pruning. Before spraying with oils or with lime sulphur wash, all rough bark on apple and pear trees should be scraped off. This will mean the certain destruction of any codlin moth larvæ hiding underneath.

Vegetable Garden.

If not previously done, asparagus beds should be well cleaned out, and a top dressing of manure given. To insure good drainage, the soil from the paths, or between the beds, may be thrown up on the beds, so as to deepen the surface drainage, and to consequently warm the beds. This will mean earlier growths. A heavy dressing of manure should be given, and the beds well and roughly dug over.

Plant out seeds of tomatoes and the pumpkin family in the frames; and sow in the open, seeds of peas, lettuce, spinach, broad beans, radish, onions, carrot and leek. Asparagus crowns, rhubarb roots, tubers of Jerusalem artichokes, shallots and onions may now be planted out. Celery should still be earthed up, taking care not to have the beds too wet.

Flower Garden.

General cleaning up and digging will be the work for this month in flower section and shubbery. Where the soil is heavy or sour, or where

sorrel is plentiful, the garden should be given a heavy dressing of fresh lime, giving a fair dusting all over the surface. Lime should not be used in conjunction with leaves, garden *débris*, leaf-mould, stable manure, or any other organic matter used for humus. These should be first disposed of by digging well into the soil; then shortly afterwards a top dressing of lime may be given. Should no humic material be used, the lime may be dug in with the autumn digging.

In cleaning up gardens, all light litter and foliage should be either dug in, or, better still, it should be placed in an out-of-the-way corner to form a compost heap. Leaf-mould, well rotted, is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Liliums, &c., are grown, or for pot plant work it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects.

Any hardy annuals may be planted out, such as stocks, pansies, wallflowers, &c., and cuttings of roses and hardwood shrubs may also be planted. In planting out cuttings it is very important that all the eyes should be removed from the part of the cutting which is to be below the ground. If this be not done, there will always be the subsequent danger of the plant suckering.

Roses and any summer and autumn flowering shrubs that have finished flowering may be pruned. If the spring flowering shrubs have not previously been pruned, they should be allowed to remain until after the next flowering season. This especially applies to such plants as Spireas, Philadelphus (Mock Orange), Deutzia, Prunus Mume, and other early flowering shrubs. To prune these now would mean the certain loss of a great proportion of their flowers.

In pruning, the shrubs may be well thinned out, especially removing any weak upright or old flowering growths; keep the shrub always at an outward growth, inclining to a broad bushy type, instead of to an upright habit. By this means, the lower regions will always be furnished with good growth. Shrubs and trees of all descriptions should never be allowed to become too crowded; they require to be opened, so as to allow sunlight and air into the interior, where it is most needed. This is one means by which this class of plants may be kept healthy and free from disease. Very few shrubs resent pruning, and the majority of them, including Australian shrubs, such as Acacias, are very amenable to the pruning knife.

In rose pruning, the rule is that strong growing plants require less severe cutting than the weak growing ones. As roses always flower on new wood, it is essential that to have good blooms the bushes must be pruned regularly. All weak growths, exhausted and worn out wood must be removed, retaining only vigorous growths. It is generally advisable to always prune to four or five eyes or buds, so as to have subsequent strong growths, always pruning into the previous season's wood. Spindly growths, especially in the centres of the bushes, should be removed, the plants being trained with an open and angular habit.

To prevent loss by decay, it will be advisable to lift and store such herbaceous plants as delphiniums, perennial phlox, rudbeckias, &c., also dahlias, tubers, chrysanthemums, cannas, and perennial sunflowers and asters. Failing the possibility of doing this, they should be lifted gently with a fork, so as to allow of a slight air space under the crown.

REMINDERS FOR JULY.

Live Stock.

HORSES.—Those stabled and worked regularly should be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley or linseed. Mares due to foal early if in poor condition should be fed liberally. Commence preparing stallion for season, especially if worked.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of the young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Newly-calved cows should be fed liberally to stimulate milk flow. Calves should be kept in warm, dry shed.

PIGS.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry. Store pigs should be placed in fattening styes. Sows in fine weather should be given a grass run. Young pigs over two months old should be removed from lucerne run.

SHEEP.—Go carefully through all breeding flocks on conclusion of lambing. Reserve all best-framed and profitable-fleeced ewes. Ear mark all found undesirable to breed from, and dispose of any that may be fat before prices recede in the spring. Use a neat mark for ear-marking, not the "slash," "top off," and "quarter," the usual rough ear marks made by the knife. Discard all undersized, narrow-framed ewes, any with short yellow fleeces, those with thin locky staple, any with very fine, light, and wasty fleeces, ewes with "bottle" udders, single teats, undershot, overshot, or otherwise deformed mouths, ewes six years old and over. Draw teeth of aged ewes altogether, if showing open and signs of feed slipping through. Consider well before selling any early born, good-fleeced ewe lambs this coming season. Select best rams for future service; remember, wide, thick sheep are best thrivers, but they must carry good fleeces as well. Keep all ewes well crutched and the udders and eyes well cleared of wool previous to lambing. Give lambing flocks good attention. The early lambing over an extensive area has been again a partial failure, therefore every lamb saved will be well worth the trouble.

POULTRY.—Mating of birds intended for breeding purposes should receive immediate attention. Ten second-season Leghorns or Minorcas, or six of the heavier birds, such as Orpingtons, Plymouth Rocks, and Wyandottes (preferably in their second year), with a vigorous unrelated cockerel will be found satisfactory. Table birds bred in March or April will pay handsomely prior to the Cup Carnival. A tonic in drinking water as a preventive against chicken pox and other ailments is advantageous.

Cultivation.

FARM.—Finish sowing barley, peas and beans, and late white oats in backward districts. Trim hedges. Fallow for potatoes, maize, and other summer crops; in early districts, plant potatoes. Graze off early crops where possible.

ORCHARD.—Continue to plant deciduous fruit trees, bush fruits, and strawberries. Continue cultivating and pruning. Spray for mites, aphides, and scales.

FLOWER GARDEN.—Plant shrubs, climbers, and permanent plants, including roses; also annuals and herbaceous perennials, early Gladioli, Liliums, Iris, and similar plants. Continue digging, manuring, trenching, and liming.

VEGETABLE GARDEN.—Plant out seedlings. Sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes. Dig all vacant plots.

VINEYARD.—Proceed with pruning, burning off, and ploughing. Complete, as early as possible, the application of manures if not already done. Mark out land for new plantations. If ground is in good order and not too wet, proceed with plantation of young vines (unpruned). Remove cuttings or scions from vines previously marked, and keep fresh by burying horizontally in almost dry sand in cool, sheltered place. Permanently stake or trellis last year's plantations.

Cellars.—Rack all young wines, whether previously racked or not. Rack older wines also. For this work choose, as much as possible, fine weather and high barometer. Fill up regularly all unfortified wines. This is a good time for bottling wine.

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THE RAISING OF DAIRY HEIFERS.*

By R. R. Kerr, Dairy Supervisor.

Considering the great shortage of dairy cows, consequent on the unparalleled drought last year, with its attendant misery and death of cattle, the subject under discussion makes a strong appeal to all stock raisers. The price of meat to the consumer for the next few years will be mainly influenced by the number of calves reared at the present time. Our flocks and herds are depleted, importation on a large scale is out of the question, and only one thing remains to be done—the reservation of desirable females for breeding purposes. While the object of this paper deals with the subject from the stand-point of the dairyman, and only advocates rearing the best calves, the grazier has a problem to solve in securing cattle to supply the meat markets, and it will be to his interest to see as many calves reared as possible.

Many calves can be reared in the Western and Gippsland Districts at a very cheap rate, owing to the abundant supply of skim milk. In the past, I am doubtful if it paid to rear steer-calves on the dairy farm; but, for the next few years, the prices will be high, and the rearing of calves will considerably augment the farmer's income. This applies more especially to the farmers who hitherto failed to take advantage of that much-neglected food, skim milk.

The large amount of skim milk always available appears to disparage its value, but no other food has the same properties for building bone and muscle. The time is not far distant when its full value will be realized, and the farmer will then look back to the time when he doubted its value at 1d. per gallon, and sometimes poured it down the drain. Many are the cases when farmers, returning from the creameries, emptied their cans on the roadside. If it had been systematically applied to their own land, the loss would have been lessened, as some of its manurial

* In writing this article I am indebted to Mr. E. Steer, Herdsman at the Research Farm, for many valuable suggestions.

properties, especially phosphoric acid, would have been returned to the soil; but such wanton waste is unpardonable.

The rearing of calves may appear to be a very simple matter, but it is only when one has to deal with the animal in its mature form that the folly and neglect of its early treatment becomes apparent.

Many different methods of feeding and treatment are practised. The system followed by our beef-breeders would spell ruin to the dairy farmer; likewise, the ordinary dairy-fed calf is not the most profitable for the grazier.

As to what is the best method of rearing our dairy heifers, is a contentious question, as many conflicting systems sometimes appear to succeed. Ever since our dairy cattle were domesticated, the whole aim has been to mould the dairy heifer into the ideal dairy cow. The question arises, "What is an ideal dairy cow?" In the first place, I would say an animal with the ability to economically consume a large amount of fodder; secondly, soundness of constitution, and early maturity; and lastly, an even-tempered, kindly disposition. These *important factors, combined with proper management, form the start* for maximum production, which should be the dairyman's ambition.

The attainment of maximum production can only be achieved by careful feeding, kindly handling, and a general knowledge of the young animal's requirements. It does not seem reasonable to assume that *soundness of constitution, robustness, and fair bodily size, can come as* the result of underfeeding, although many dairy farmers think they can. This fact is apparent to any one who visits many of our dairy farms—the weakly-constitutioned, stunted cows one sees suffer in the battle for existence, and cannot withstand many years of profitable milk flow. When the young animal's health is impaired, as the result of scanty and careless feeding, and dirty surroundings, it becomes susceptible to many of the diseases that stock is heir to; its usefulness as a dairy cow is diminished, and its market value reduced.

Many of our breeders who aim at prizes in the show-ring, often practise a system of scanty feeding to secure fineness of bone. These men are generally martyrs to type, and do not work in the interests of the producing powers of the breed, as by their methods they are retarding the development of their cattle.

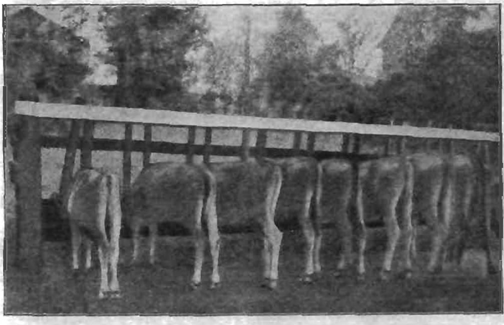
On the other hand, too plenteous feeding of concentrated rations is not advisable; it develops in the young animal the tendency to make flesh and attain coarseness, and animals so fed are often deficient in barrel development, which is so essential in a dairy cow.

When a bulky ration is fed, the barrel development is much greater, and enables the heifer at maturity to consume a large amount of fodder. Generally, the largest consumers are the most profitable producers. The feeding of bulky foods develops the digestive organs, and enables the animal to assimilate a large amount of food.

There is a medium between the methods of the beef-raiser and those who practise a starvation policy, and by its adoption, the heifer is kept in a good growing condition until it is proven in calf, when it can be fed a more nutritive ration to build up a reserve in the animal's body to withstand a long milking period, and nourish the unborn calf. The first lactation period is of the utmost importance, and on the treatment given at that time depends, to a great extent, the young animal's usefulness as a profitable dairy cow.

There is a considerable variation in the natural conformation of cattle of any particular breed. One type may belong to the beef cattle, and another be the ideal of the show-yard fancier; a third may be controlled by *the richness of the pastures. For instance*, Jerseys bred and reared on the best Western and Gippsland farms, almost attain the size of shorthorns. While they would not win a prize in the show-yard in competition with the fine-boned type, their milking qualities are not impaired, but rather increased, and they possess a much stronger constitution.

The sooner the farmers of the State pay more attention to the productive qualities of their cattle, the sooner will their returns increase, provided cattle are pure bred, and have inherent milking ability. On appearance, some of the very best cows in the State to-day would be classed as beefers; but any good dairy cow should put on flesh when not producing, as the food usually needed to make milk and butter is then building up nature's storehouse to draw upon during the lactation period.



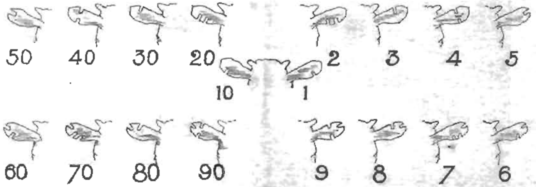
A Group of Calves at Louisiana Experiment Station. Trough and Bail Feeding.

The Department of Agriculture, through its Pure-bred Herd Testing Scheme, is doing good work for the farmer, if he only realized it. Published lists of the performances of many of our pure herds should give him a good idea where to purchase a sire. These sires can be purchased at a very reasonable price from the breeders, and there is no excuse for a dairyman to be using a bull from an untested cow. A few extra pounds spent in the purchase of the right bull is a good investment, when we consider the increased value of his progeny. A dozen heifers a year for three years, at an increased value of only £1 per head, would mean £36. But the majority of our farmers would be astounded if asked to give that price for a bull. They seem content to rely on the progeny of mongrel sires, valued by the number of cows they put in calf.

When crossbred sires are used, undesirable traits are very frequent, and the progeny is not uniform in quality. Hence, the returns of many of our milking herds are disappointingly low. Breeding for the dairy is a comprehensive study, and needs all the forethought that an intelligent farmer can apply to it.

Before dealing with the treatment of the young calf, we will presume that a desirable sire of sound constitution has been used, and that he is not introducing the germs of contagious abortion into the herd. The first principle to be observed is: that the progeny is first fed through the mother, and that any shortage of feeding at the period of pregnancy affects the unborn calf. Any sudden change of feed to the cow at this stage is also unwise.

Examine all young calves for deformities, and remove rudimentary teats from the heifers, dehorn all cross-bred stock—this should be done during the first week by clipping the hair from the horn bud, and applying caustic potash. In the case of male calves, see that their testicles are well developed. Never use a bull with one testicle, as such a fault is generally hereditary.



System of Number Ear-marking.

The young calf needs some identifying brand at an early date, in case of confusion as to dam, and the accompanying system of ear-marking is very effective.

The calf should be taken from its mother within twenty-four hours after birth, and allowed to remain another twelve hours before any attempt at feeding is made—the calf is then hungry, and will more readily adapt itself to the will of the feeder. Always feed the mother's milk for a few days—it contains medicinal properties of benefit to the young animal. The change from whole to skim milk should be gradual—any sudden change from one food to another causes stomach trouble.

Generally, if the correct methods are adopted, the calf will feed itself within a fortnight. Any one attempting to feed calves must work on a system, and be possessed of patience, to achieve success. A calf cannot be forced to drink. Women make better calf feeders than men; they seem to have more patience, and use more kindly treatment. In open-trough feeding, unnecessary violence is often vented on the calves in preventing the quickest drinker from obtaining too great a quantity, and it is no uncommon sight to see a heavy stick used for the purpose, sometimes inflicting permanent injuries. A piece of ordinary rubber hose pipe is just as effective, and does no harm. The bail system of

feeding is the ideal method, the calves receiving their correct allowance without any bustle or hurry, and the usual practice of sucking ears is prevented. The bails can be erected very economically, and half kerosene tins used as feeding vessels; but the tins need washing every day, just as well as the other dairy utensils.

Many failures are found in rearing calves; but skim milk in itself cannot be blamed, as it is a food specially endowed by nature for rearing heifers. The portion (fat) removed by the separator is not absolutely essential, and can be replaced by a less costly substitute. When trouble occurs, it is generally the result of non-observance of the following rules:—"Absolute cleanliness," "Regularity in time and quantity of feeding," and "Temperature," which should be 101 to 102 degrees Fahrenheit (body heat), and never under 80 degrees Fahrenheit—this applies to all calves under four months old.

As to the quantity to feed the calf, the feeder will be guided by the ability of the calf to utilize a given amount; but never overfeed. Many deaths occur as the result of too much freshly-separated skim milk.

Herkes's Patent Movable Bail Feeding Arrangement for Calves.

Herke's Patent Movable Bail Feeding Arrangement for Calves.

Most of the calf meals on the market are suitable as substitutes for the fat removed by the separator. Linseed, pollard, and cod liver oil are also good. Linseed is probably one of the best, and when soaked with water and boiled, becomes a jelly, a cupful of which, given to the calf twice daily in the milk, goes a long way in keeping it thriving.

Some difficulty will be found in giving calves cod liver oil, as it is an acquired taste—this applies to some of the other calf foods as well. The mechanical calf feeders on the market are effective in themselves, but the danger lies in keeping them in a sanitary condition, as filth germs are the greatest source of trouble in calf rearing. Scours are the general outcome of neglect in this respect.

Milk that passes through closed pipes, which do not permit of efficient cleansing, becomes contaminated. The all too common use of milk unfitted for market purposes as food for calves, should be avoided. I refer in particular to cows suffering from sickness, udder injuries, or

mammitis. The sickness may be a serious disease, and the calf becomes affected. Considering the prevalence of tuberculosis in some of the main dairying districts, the danger of feeding milk from tubercular cows presents a continual menace; such being the case, the skim milk needs boiling or heating to 180 degrees Fahrenheit to kill the germs of the disease. The mere fact of cattle showing pronounced signs, or succumbing to tuberculosis at under two years of age, is convincing proof that the disease was contracted when in the calf stage. Steam should be used in all dairies, and not much extra expense is required to enable the fixing of a steam pipe to heat the milk. During the warm weather, the boiling prevents the milk from souring.

Many farmers who are strictly clean in ordinary daily routine work, are plainly neglectful with the calves—dirty drinking vessels and filthy calf pens are the surest causes of failures in calf rearing. Calves would be better exposed to all rigors of climatic changes than confined in unhealthy pens. Calf pens need impervious floors, and raised wooden platforms supplied with plenty of bedding. To allow the calves to camp on an accumulated mass of semi-decomposed manure, is courting disaster, and one of the surest ways of inviting pneumonia. The pens should be erected on well-drained ground, and face the morning sun, and be so constructed as to permit of the drafting of the calves according to their ages. The sheds should be limewashed, and the drains and floors well sprinkled with lime—it adds to the appearance, and helps to preserve healthy conditions.

One of the healthiest methods of rearing is to erect a grass hay-stack in the calf paddock, and allow the calves to have access to it; they can eat at will, and always have the benefit of a sheltered side.

For the calves of advanced age, a small water-trough is needed in their enclosure. When very large troughs are used, the water becomes stale, unless emptied frequently.

Calves are often the victims of foolish pranks by children who are ignorant of the damage they are doing. When calves have been frightened and ill-used, they always are in fear, and never develop into the leisurely, good-tempered animal so much desired. Do not allow horses to run in the same paddock, as they frequently kick calves, who will persist in getting in the way.

The calf pens should be at a distance from the main dairying building, the bleating of the young animals agitate the newly-calved cows, and the presence of either one is detrimental to the well-being of the other.

By feeding the calves at regulated intervals, their organs of digestion become accustomed to their work. Dairy calves are generally fed twice daily; this should be early in the morning and late in the evening, to more evenly regulate the period elapsing between the meals. Calves are creatures of habit, and pay well for a definite system of treatment.

When the young calf is two or three weeks old, it begins to eat hay, at first only a straw at a time, but the longing increases very quickly, and if fine hay is supplied, either lucerne, clover, or meadow, the calf does well on it, and suffers less from scours. The hay should be fed in small racks in a sheltered position.

Once the feeding has commenced, any ordinary farm hay or grain may be utilized. Use only small mangers or troughs, and do not allow any stale food to remain.

Chaff and bran may be given when pastures are scanty, and silage is relished by them when the taste is acquired; but avoid mouldy or fermenting food, as scours are certain to result.

A cupful of limewater given in the milk once daily reduces the scour.

Limewater.—Place a few handfuls of quicklime in a tub and fill up with water. Stir up, and allow to settle; the clear water is limewater. When used, fill and stir up again until all the lime is absorbed, which may be seen by breathing through a tube into the limewater. If lime is present, the water will become cloudy. If all the lime has been used up, the water will remain clear, and more lime needs adding.

Ringworm.—This skin disease is very prevalent amongst calves. White scaly patches appear, without hair—most abundant about the head and neck. It is caused by a vegetable parasite. The patches may be destroyed by applying red mercurial blistering ointment, made by mixing one part biniodide of mercury with sixteen parts of lard. The parts should be prepared by scraping off the scales before applying the dressing.

Early maturity must become an important factor in dairy farming as progress is made, and, in perusing the returns, we find this welcome ability strongly inherent in our dairy cattle.

Even since the breeding of cattle has been seriously entered upon, early maturity has been one of the greatest aims, not only in dairying, but in all branches of live stock husbandry. A much quicker turnover of capital, and a greater return for the food supplied, is obtained from the younger animals, as their powers of digestion and assimilation are more pronounced.

Cattle which possess heavy milking qualities at an early age must have an added value, and the performances of the one year and ten-month old heifers, under herd testing conditions, have every claim to recognition. The return of 304 lbs. fat (over £15 worth), and the 16 lbs. of 6 per cent. milk on the last day of the nine months, speaks well for the breeders and the phenomenal dairy development of their cattle. On appearance, these animals have not suffered in any degree. If the heifer's bodily development receives a check when young by supplying insufficient nutritious food, no amount of extra feeding afterwards can compensate for the former neglect.

While the early maturing qualities of some of our cattle are so strongly developed, there is perhaps a limit in this direction, so much so, that the constitution of the animal may be impaired, and loss of powers of production may result after a few lactation periods.

The old practice of keeping dairy heifers until three years and over before calving, is a thing of the past, and the extra size of the animal, or the yield in milk and butter, in no way compensates for what might be termed one year of idleness. I consider that two years and three months is young enough; but the idea of allowing them to be three years old before coming into profit is false economy.

When the testing of cows becomes general—as it must do—cows then will be sold on performance, and their untried heifers on the performances of their dams. Greatly increased prices to what generally exists to-day will then be obtained.

NINE MONTHS' TEST PERIOD.

Average Production at Different Ages.

Number of Heifers.	Age in months.	Milk.	Test.	Fat.	Com. Butter.	Milk last day.	Fat value 1s. per lb.
		lbs.		lbs.	lbs.	lbs.	£ s. d.
8 ..	22·3	5,141·06	5·92	304·73	347·38	16	15 4 9
26 ..	25·8	5,545·81	5·27	312·93	356·74	15·48	15 12 11
9 ..	33·1	6,896·44	4·75	327·66	373·67	14·36	16 7 7

While 102 heifers secured certificates under the 175 lbs. fat standard, 43 made 275 lbs. fat and over, and averaged 26.7 months old at the time of calving, and in their nine months' test period, yielded 6,032 lbs. milk; test, 5.21; fat, 314.5 lbs.; and 15½ lbs. milk on the last day of the nine months. When the fat is taken at 1s. per lb., the return is equal to £15 14s. 6d. per head, which would be considerably augmented in a twelve months' season, as they are yielding nearly 1 lb. fat on the

Ayrshire Bull "Wallace of Gowrie Park," his Dam, Laura, and First Progeny, "Bloomer of Gowrie Park."

last day; so that the return would be in the vicinity of £17 per head; also the value of the skim milk, rich in non-fatty solids, which, in these days of high prices, is worth at least 2d. a gallon, but for comparative purposes is put at 1d. per gallon, equals £2 10s. In addition must be added the value of the pure calf, which, in the case of the above heifers, is easily worth £20. Seeing, then, that at two years three months, which is slightly above the average, they started to produce, if they had begun at three years old, the above-mentioned returns would be lost. Such heifers can be reared for £7—

Six months' skim milk, at 1d. per gallon (2 gallons daily)	£1	10	0
Twelve months' grass, at 9d. per week ...	1	19	0
Nine months' grass, at 1s. 3d. per week ...	2	8	9
Labour	0	10	0
Hay, or chaff, or grain	0	10	0
	£6	17	9

The following analysis of the returns of heifers under the Herd Testing Regulations, will show the value of breeding and caring for good animals, and also the value of testing as demonstrating their productive qualities.

TWO YEARS TO TWO YEARS SIX MONTHS (INCLUSIVE).

Name of Heifer.	Owner.	Breed.	Milk.	Test.	Butter Fat.	Com. Butter.	Milk Last Day.	Age at Calving.	Sire of Heifer.
			lbs.		lbs.	lbs.	lbs.		
1. Ivoline of Gowrie Park ..	W. P. Brisbane ..	Ayrshire ..	8,564	4·84	414·78	472·75	19½	2 years ..	Heather Jock II.
2. Bloomer of Gowrie Park ..	W. P. Brisbane ..	Ayrshire ..	8,138	4·62	375·75	428·75	25½	2 years 1 month	Wallace of Gowrie Park
3. Linnett of Gowrie Park ..	W. P. Brisbane ..	Ayrshire ..	7,783	4·61	359·09	409·25	19½	2 years 5 months	Lessnessock (imp.)
4. Sparkle	C. D. Lloyd	Jersey ..	5,672¼	6·32	358·85	409	15	2 years 1 month	*Lucy's Noble of Oaklands*
5. Parrakeet	Gordon Lyon ..	Jersey ..	7,287	4·70	342·65	390·5	18	2 years 2 months	Nellie's Defiance
6. Lassie Fowler of Melrose (467) ..	W. Woodmason ..	Jersey ..	5,977	5·69	340·32	388	15½	2 years 1 month	Pretty Noble (imp.)
7. Chevy VIII. of Melrose	W. Woodmason ..	Jersey ..	6,011	5·63	338·56	387·75	19	2 years 3 months	Pretty Noble (imp.)
8. Foxglove of Springhurst ..	*J. D. Read*	*Jersey* ..	*6,073¾*	5·44	329·75	376	14½	2 years 2 months	Captive
9. Peerless Pearl	F. Curnick	Jersey ..	6,000	5·34	320·71	365·5	15	2 years 3 months	Larkspur's Lord Twylish
10. Goldleaf	Department of Agriculture	Red Poll	6,437¼	4·79	308·50	351·5	14	2 years 3 months	Tabacum
11. *Empire of Melrose* (470) ..	W. Woodmason ..	Jersey ..	5,661	5·42	307·08	350	15	2 years ..	Pretty Noble (imp.)
12. May Bee	G. D. and H. S. Wood	Jersey ..	4,863	*6·19*	*301·25*	*343·5*	14½	2 *years* ..	Captor
13. Dainty VI.	Trevor Harvey ..	Jersey ..	5,306	5·66	300·33	342·25	19½	2 years 5 months	Young Black Antimony
14. Edith of Melrose (462)	W. Woodmason ..	Jersey ..	5,418	5·48	296·69	338·25	14	2 years 6 months	Pretty Noble (imp.)
15. Nightshade of Springhurst ..	J. D. Read	Jersey ..	5,963¾	4·97	296·50	338·25	21½	2 years 1 month	Young Defiance
16. Tulip of Gowrie Park	W. P. Brisbane ..	Ayrshire ..	6,588½	4·47	294·26	335·5	27½	2 years ..	Lessnessock (imp.)
17. Lily IV. of Melrose	Wm. Woodmason ..	Jersey ..	5,026¾	5·83	293·20	334·25	13¾	2 years 5 *months*	*Clementine* II. Beau
18. Banker VI. of Melrose	Wm. Woodmason ..	Jersey ..	5,743½	5·08	291·90	332·75	20½	2 years 5 months	Wild Rover
19. Princess of Tarnpin	C. G. Knight ..	Jersey ..	5,674	5·07	287·98	328·25	11½	2 years 3 months	Starbright V. Lord Twylish
20. Chevy VII. of Melrose	Wm. Woodmason ..	Jersey ..	4,816¾	5·97	287·63	328	12½	2 years ..	Mystery's Son of Melrose
21. Peerless VII. of Melrose ..	Wm. *Woodmason* ..	*Jersey* ..	4,683½	6·13	287·37	327·5	12½	2 years 5 months	Clementine II. Beau
22. Graceful Duchess X. of Melrose ..	Wm. Woodmason ..	Jersey ..	4,230½	6·68	282·75	322·5	10	2 years 2 months	Jessie IV. Son of *Melrose*
23. Buttercup of Springhurst ..	J. D. Read	Jersey ..	5,043¼	5·59	282	321·5	14½	2 years 2 months	Young Defiance
24. Merlin	W. T. Manifold ..	Shorthorn	8,126	3·46	280·75	320·25	5¾	2 years ..	Duke Coragulac
25. *Handsome Girl* VI. of Melrose ..	Wm. Woodmason ..	Jersey ..	4,234	6·63	280·56	319·75	12	2 years 1 month	Jessie IV. Son of Melrose
26. Pleasance V. of Melrose ..	Wm. Woodmason ..	Jersey ..	4,859¼	5·71	277·57	*318·5*	13¼	2 *years* 1 month	Pretty Noble (imp.)
Average	.. .. ..	..	5,545.81	5·27	312·93	356·74	15·48	25·8 months	

Analysis of the returns of Heifers under the Herd Testing Regulations—*continued.*

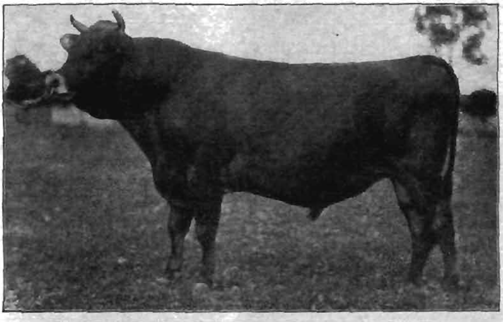
Name of Heifer.	Owner.	Breed.	Milk.	Test.	Butter Fat.	Com. Butter.	Milk Last Day.	Age at Calving.	Sire of Heifer.
			lbs.		lbs.	lbs.	lbs.		
Over Two and a Half Years and under Three Years.									
1. Stella of Gowrie Park ..	W. P. Brisbane ..	Ayrshire ..	9,398	4·75	446·42	509	22	2 years 8 months	Wallace of Gowrie Park
2. Polly of Melrose ..	Wm. Woodmason ..	Jersey ..	7,446½	4·87	362·36	413	20½	2 years 8 months	Mystery's Son of Melrose
3. Queen Bee of Gowrie Park	W. P. Brisbane ..	Ayrshire ..	6,880	4·85	330·04	376·25	13½	2 years 8 months	Wallace of Gowrie Park
4. Martha of Gowrie Park	W. P. Brisbane ..	Ayrshire ..	6,529	4·88	318·39	363	13½	2 years 8 months	Dr. Cranwell
5. Ruby Queen of Gowrie Park	W. P. Brisbane ..	Ayrshire ..	7,174¾	4·37	313·64	357·5	17½	2 years 10 months	Brown Lad of Gowrie Park
6. Moonlight of Gowrie Park	W. P. Brisbane ..	Ayrshire ..	6,896	4·51	311	354·5	12	2 years 10 months	Lessnessock (imp.)
7. Lady Grey V.	A. W. Jones	Jersey ..	5,437¾	5·62	305·75	348·75	12	2 years 11 months	Guarantees Antimony
8. Pipio	Department of Agriculture	Red Poll	6,045½	4·68	282·86	322·5	17	2 years 11 months	Tabacum
9. Gladys of Gowrie Park ..	W. P. Brisbane ..	Ayrshire ..	6,340½	4·39	278·50	317·5	..	2 years 8 months	Brown Duke of Gowrie Park
Average	.. .. ..	..	6,896.44	4·75	327·66	373·52	14·36	33·11 months	
Under Two Years									
1. Jennie Lind VIII. of Melrose	Wm. Woodmason ..	Jersey ..	5,639	5·78	326·08	371·75	15	1 year 11 months	Mystery's Son of Melrose
2. Luxury II.	E. N. and S. O. Wood ..	Jersey ..	6,177½	5·26	325·25	370·75	15½	1 year 11 months	Topaz's Defender
3. Jessie of Melrose (428) ..	Wm. Woodmason ..	Jersey ..	5,063	5·99	303·25	345·5	18	1 year 11 months	Pretty Noble (imp.)
4. Eva	F. Curnick	Jersey ..	6,015¾	5·00	301	343·25	20½	1 year 11 months	Larkspur's Lord Twylish
5. Peerless VIII. of Melrose	Wm. Woodmason ..	Jersey ..	5,443	5·52	300·25	342·25	15½	1 year 9 months	Mystery's Son of Melrose
6. Mistletoe of Tarnpin ..	C. G. Knight ..	Jersey ..	5.888½	5·01	295·09	336·5	17½	1 year 8 months	Starbright V. Lord Twylish
7. *Blue Belle of Pine Hill* ..	C. D. Lloyd	Jersey ..	4,781	6·16	294·45	335·75	14½	1 year 11 months	Starbright's Carnations Fox
8. Mystery XIII. of Melrose	Wm. Woodmason ..	Jersey ..	4,121½	7·94	292·50	333·25	11½	1 year 11 months	*Jessie IV. Son of Melrose*
Average	.. .. ..	..	5,141·6	5·92	304·73	346·75	16	22·37 months	

Complete Averages.

Total Number.	Age, in Months.	Milk.	Test.	Fat.	Butter.	Milk, Last Day.	Fat Value, 1s. per lb., 9 Months.
43	26·7	lbs. 6,032	5·21	lbs. 314·54	lbs. 358·53	lbs. 15·5	£ s. d. 15 14 6

Many heifers are reared at a cheaper rate, but generally on very poor country; whereas, once in calf, they need the very best pastures or feed to develop them.

When heifers like the above are reared, by breeding on sound lines, the theory that it "Does not pay to rear calves," is easily refuted. There certainly are heifers that it does not pay to rear for dairy purposes, but they are generally the result of lack of knowledge, or neglect in some particular direction; although instances are on hand where farmers will continue to use bulls they know to be unprofitable, and scatter their progeny over the State, perhaps ruining some unfortunate farmer who secures them.



W. Woodmason's Jersey Bull, "Pretty Noble" (imp.).

To individualize in this splendid collection of heifers may be deemed unwarranted, but the performances of "Stella," and "Bloomer," belonging to Mr. Wm. P. Brisbane, call for special mention; while "Queen Bee" also did very well. These three heifers are by the bull "Wallace," of "Gowrie Park," who promises to excel as a sire of first class dairy stock.

Name of Heifer.	Milk.	Test.	Fat.	Butter.	Milk Last Day.	Age at Calving.	Sire of Heifer.
	lbs.		lbs.	lbs.	lbs.		
"Stella" of Gowrie Park	9,398	4·75	446·42	509	22	2 years 8 months	Wallace of Gowrie Park
"Bloomer" of Gowrie Park	8,138	4·62	375·75	428·75	25½	2 years 1 month	Wallace of Gowrie Park
"Queen Bee" of Gowrie Park	6,800	4·85	330·04	376·25	13½	2 years 8 months	Wallace of Gowrie Park
Average ..	8,112	4·73	384·07	437·83	20·33	29·66 months	

The Government Herd Testing Scheme has not yet been long enough in existence to present a very complete list of sires showing consistent dairy heredity, but its influence for good will become more apparent as time goes on.

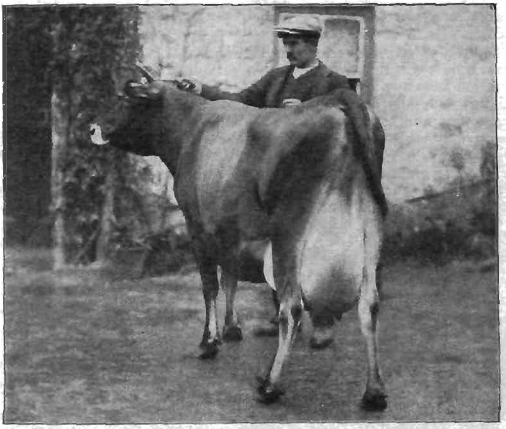
The Jersey bull "Pretty Noble," imported from the Jersey Islands by Mr. W. Woodmason, has proved himself the sire of very fine heifers, and the yields of the first seven to complete the nine months' test are given, which, for consistency and general ability, would be very hard to beat. It is a matter of satisfaction to know that our breeders, generally speaking, now import only animals having records of butter production. Though they are desirous of securing animals true to type, they realize that production is the main essential.

Name of Heifer.	Milk.	Test.	Fat.	Butter.	Milk Last Day.	Age at Calving.	Sire of Heifer.
	lbs.		lbs.	lbs.	lbs.		
Lassie Fowler of Melrose (467)	5,977	5·69	340·32	388	15½	2 years 1 month	Pretty Noble (imp.)
Chevy VIII. of Melrose	6,011	5·63	338·56	387·75	19	2 years 3 months	Pretty Noble (imp.)
Empire 476 of Melrose	5,661	5·42	307·08	350	15	2 years ..	Pretty Noble (imp.)
Jessie 478 of Melrose	5,063	5·99	303·25	345·5	18	1 year 11 months	Pretty Noble (imp.)
Edith 462 of Melrose	5,418	5·48	296·69	338·25	14	2 years 6 months	Pretty Noble (imp.)
Pleasance V. of Melrose	4,859	5·1	277·57	316·5	13½	2 years 1 month	Pretty Noble (imp.)
Gr ceful Duchess 476 of Melrose	4,470	6·02	269·29	306·98	14½	1 year 8 months	Pretty Noble (imp.)
Average ..	5,351·2	5·69	304·68	347·33	15·6	24·8 months	

Decentralization is one of the burning questions of the day, and for our young, trained farmers to leave the land and seek employment at some apparently more attractive employment in the city, is indeed a loss to the State. The very root of this trouble often rests with the farmer who bemoans his fate, complaining of the ingratitude of his children. Enthusiasm is generally the keynote of success in any business, and this enthusiasm is lacking at many farms where, after years of dairy farming, the cows are not even named, and if any calves are reared, the sires and dams are either unknown or forgotten. During the present season, a large herd of dairy cows was disposed of, and, as the result of twenty odd years of dairy farming, the cows were sold without a name, and minus any record of their abilities as producers. This is only one of the many cases which could be cited, but is in itself a striking instance of the owner's neglect of his responsibilities, and disregard of common fairness to his business.

"Boys learn best by example." It is up to the farmers to look on the bright side of their calling—dairying, when worked by slack methods, becomes a drudgery. Any farmer who has any respect for his calling, should teach his children to love animals, remember their pedigrees

and capabilities in whatever line of production he is engaged in. Teach them to test the cows, and rear the calves from the best, and name the heifer when young. A farmer's boy, imbued with the right spirit and a respect for his calling, will be a great benefit to his father as the years pass by, and a direct acquisition to the producing interests of the State. Do not blame the children for not taking an interest in the dairy, when you show by example that you have not sufficient enthusiasm to test the cows and cull out the animals that never pay their way. Any bright, sensible boy wants to know what the future



Dam of "Pretty Noble," "Boutilliere."

holds in store for him, and he cannot be expected to kindle an enthusiasm in a business that is being decried by his own father.

If we are going to save the rural population, we must put our best efforts on the building of a home that will have all the conveniences of the city, with all the glory of the country, so that when the girls and boys reach womanhood and manhood, their one desire will be to remain on a portion of the old farm, and rear a home patterned after the one in which they spent the happy days of their youth.

PORTUGUESE VARIETIES OF VINES.

By M. d'A. Burney.

When Mr. de Castella visited Europe on behalf of the Victorian Government he made arrangements for the grafting in France of some varieties of Portuguese vines. The major portion of these vines imported by Mr. B. W. Bagenal, was acquired by Mr. A. Prentice, and was planted in his vineyard near Rutherglen. At the end of 1913 this vineyard was purchased by Burgoyne Bros. As it contains the largest area under Portuguese varieties in Australia, it may be of interest to record the result of the 1916 vintage, as each variety has been gathered, weighed, and fermented separately. In the two previous years the crop was so small that separate treatment was quite impossible. The wine resulting from the mixture is totally different in style and character from any other sweet wines produced here; but, as the varieties were mixed, it was impossible to attribute this difference to any one variety. The three varieties are Touriga, Alvarelhão, and Bastardo. These may be considered to be the most important of the varieties cultivated in Portugal, but there are others which find favour in Portugal and which are not included in the Mount Athos vineyard. Among those absent it would be of interest to mention:—Souzão, Mourisco Preto, Donzellinho do Castello, Tinta Cão, Tinto Carvalhõ, &c., all of which are largely cultivated in Portugal. The selection made by Mr. de Castella was, however, for the purpose of obtaining grapes of the finest quality only for the production of wines of a port type.

The results obtained at the 1916 vintage appear to amply justify this selection. In order to compare the yield of these Portuguese varieties with other varieties well known in Australia, the following table showing the yield per acre and the sugar strength of the bulk will be of interest. Considerable care was taken to pick each variety separately in order to get an absolutely accurate estimate of the yield per acre. Picking took place of all the varieties described below upon the 21st and 22nd March:—

Variety.	Yield per Acre.			Sugar Strength.
	tons.	cwt.	qrs.	Beaumé.
Touriga	2	6	3	12.5 degrees
Bastardo	2	4	1	13 degrees
Alverelhão	1	15	1	13 degrees
Grenache	2	6	0	14 degrees
Shiraz	2	3	0	16 degrees

It will be seen that the sugar strengths are appreciably less than Grenache and Shiraz picked under similar conditions. The soil is of schistose formation, with a considerable proportion of stone running through it. The appearance of the grapes at the time of vintage was deceptive. Bastardo is the earliest vine to come into leaf. The grapes appear to ripen earlier than Shiraz, but the vegetation is by no means

luxuriant, and the leaves start to fall early. In 1915 the sugar strength of Bastardo was 16 degrees at the beginning of vintage in February. The lower sugar strength this year was probably due to insufficient foliage to nourish the crop, but the bunches contained a very large percentage of raisins, of which the sugar was not in solution in the must when the sugar strength was taken.

Alvarelhão is a far more vigorous grower, and the somewhat pale-coloured bunches were extremely numerous, but they weighed very badly. The berries had started to shrivel, and the acidity strength had greatly diminished. At the same time, this variety could have been picked later with advantage, although in appearance complete maturity had been reached. Judging from the experience of the 1916 vintage, Alvarelhão is not a heavy bearer, and must be classed as a quality grape pure and simple.

Touriga carried a good crop, which proved to be larger than that carried upon the Grenache, although in appearance the crop on the Grenache seemed very much superior. The bunches were solid and well filled, and showed no signs whatever of shrivelling from the heat. This must be classed as a variety ripening later than Shiraz, and standing dry weather better. If it had been picked later the sugar strength would undoubtedly have been greater. This appears to be an extremely valuable vine. The yield is satisfactory, it resists drought well, the berries are thick-skinned, and stand weather, and the quality of the wine is at present showing great promise. It is a variety to be recommended for extensive culture. As it appears to ripen later than Shiraz it should be of very great utility in the Rutherglen district for dry wines as well as sweet.

All the Portuguese varieties were fermented in the same manner. The grapes were stemmed and crushed, and the must was pumped into the fermenting tanks in the ordinary way. Yeast was at once added of a variety cultivated by Mr. de Castella, and which was used for the whole Mount Ophir vintage. No false heads were used, and the skins were allowed to rise to the surface. As soon as the marc became firm the liquid was run off from the skins on an average 24 hours after the vats had been filled. Contact with the skins might have been prolonged with advantage with Bastardo and Alvarelhão without unduly increasing the colour. Touriga if left in prolonged contact with the skins would produce a wine of very deep colour. Fermentation was checked by fortification when the must of each variety had been reduced to about 5 degrees Beaumé. Owing to a limited spirit supply each variety did not receive identical treatment, and a slight variation in sugar content resulted. During fermentation each variety had a totally different perfume to the better-known European varieties. In the case of Alvarelhão this was especially marked.

The wines resulting are now entirely distinct. Alvarelhão has a pronounced bouquet and pungent almost peppery flavour. Bastardo is a pale-coloured wine with a most marked raisin flavour. Touriga is a wine of distinctive character, and a flavour already suggesting vintage port. Grenache treated under identical conditions is a far more neutral wine.

At a later stage it will be more easy to arrive at a true estimate of the relative quality of each variety. At present the wines show great

promise, and seem to be quite different from the produce of any other European varieties. It is already obvious that to obtain a wine of a "vintage" type more prolonged contact with the skins is necessary. In Portugal prolonged maceration is the rule, whether the wines are intended for "vintage" or tawny types. Here in Australia Brown Muscat is frequently introduced into port blends, with the result that the blend losses any resemblance that it may have had to true port. Pale-coloured Australian ports which win prizes at wine shows in Australia have usually greater resemblance to brown sherry than to any other European wine. In Portugal wine-spirit only about 30 over proof is used for the fortification of the best quality wines. This is probably with the object of reducing the percentage of acidity, which does not find favour with the English palate. In Australia, where complete maturity can always be obtained, absolutely silent spirit should be preferable.

There are already cellars in Australia containing very fine old wines of the port type made from Shiraz, Grenache and other varieties which are not cultivated in Portugal. The varieties now in full bearing in the Mount Athos vineyard should enable a great improvement to be made in producing a type of wine more closely resembling true port, and for which there is a large market in Great Britain at a high price.

It is obvious that there is still much to be learned in the handling of these Portuguese varieties, but the results of the 1916 vintage should enable us to emerge from the experimental stage and act with a considerable degree of certainty in the production of wines of the port type in the future.

As reasonable success has already been achieved in the production of wines of a port type in Australia from varieties of grapes hitherto confined in Europe to the production of dry table wines, it is obvious that Australia possesses conditions of soil and climate entirely favorable to the production of sweet wines. The introduction of the true Portuguese varieties must therefore logically improve the type of wine the moment that we can learn by experience how these varieties should be treated.

Notes on Portuguese Vine Varieties.

By F. de Castella, Government Viticulturist.

Mr. Burney's note on the results of the Alto Douro Vine varieties growing at Mount Athos vineyard will doubtless be read with much interest by all Victorian wine-growers producing wines of port type.

Rutherglen, and several other parts of the north-east of Victoria, have already produced sweet wines of remarkable quality, and this mainly from grapes usually cultivated in France for dry wine production. The similarity of climate and soil to those of the Alto Douro makes it highly probable that the utilization of the vine varieties which yield the world's highest grade sweet red wines may have results of far-reaching importance in Australia.

Independent expressions of opinion, such as Mr. Burney's note, are of the greatest value at the present time, when we are beginning to cultivate, on a commercial scale, many recent introductions of considerable promise. Undue multiplication of varieties is no doubt undesirable, but there is reason to believe that some of the new-comers will

prove valuable additions. Some may even prove superior to, and eventually displace, some of our older favorites Such additions or substitutions must be entered on with caution. Recent introductions are being regularly and continuously tested, by this Department, at the Rutherglen Viticultural Station, but the co-operation of private growers in thoroughly testing these new vines is most welcome, and is cordially invited. It is hoped that Mr. Burney's excellent initiative will be followed by other growers.

The occasion is, perhaps, opportune to give some extracts concerning the true port varieties, their cultural and wine-making peculiarities, from the writings of leading Portuguese authorities.

An Explanation.

Mr. Burney gives the writer considerably more credit than he deserves in connexion with the introduction of the port varieties at Mount Athos. As the planting of these may quite possibly mark an epoch in our wine-making history, it is well that the facts, which in themselves are interesting, should be here recorded. It is true that in the course of his viticultural investigations in the Peninsula in 1907, the writer was able to secure from the Real Companhia Horticolo-Agricola Portuense, of Oporto, grafted rootlings of several choice Portuguese varieties which were planted in the collection of the Rutherglen Viticultural Station in 1908, where they are still growing. The following sorts were secured:—Alvarelhão, Bastardo, Cornifesto, Donzelinho do Castello, Tinta Amarella, Tinta Carvalha, Tinta Roriz, Touriga. Several others, notably Souzão, Mourisco Preto, Tinto cão, were not obtainable. The vines, the packing of which was scarcely adequate for so long a voyage, arrived only in fair order; nevertheless some of every variety imported, survived.

The extensive plantation at Mount Athos is to be credited to the initiative of Mr. Alec. Prentice, who, in 1910, managed the property (then known as Emu vineyard) for Messrs. Prentice Bros. Mr. Prentice, who was then placing a considerable order for grafted vines with Richter's nursery at Montpellier (France), through Mr. B. W. Bagenal, was desirous of obtaining some of the best Port varieties. The writer was consulted as to the most suitable sorts. Port is remarkable as being the product of a greater number of distinct varieties than most celebrated wines. For the sake of simplicity, the following four were recommended as likely to combine most of the qualities characteristic of a high-grade port:—Alvarelhão, Bastardo, Touriga, and Tinta cão.

Mr. Bagenal, who was then leaving on a trip to Europe, was commissioned by Mr. Prentice to secure the necessary scions.

After repeated endeavours, he failed to do so from the leading London wine merchants, whose Oporto representatives, in his opinion, showed the same reluctance to part with any of their stock as do South African ostrich farmers. In France he was more fortunate, M. Richter being eventually able to secure the desired scions through an ex-student of Montpellier College then residing in Portugal. These scions were grafted in Richter's nurseries in January and February, 1909, struck in nursery in the usual way, and shipped to Melbourne in cool storage in 1910.

The Vines of the Douro.

The region of the Douro is without contradiction the most notable of all the viticultural regions in Portugal. It is the cradle of the most celebrated wines of the world, of those famous and inimitable ports (*Vinhos do Porto*) which have so justly acquired renown by the suavity of their flavour, by the exquisite quality of their ethery bouquet, by the nobility and solidity of their substance (*Compleicāo*). Princely wines, as they have been aptly termed, so rare are the precious qualities which distinguish them.*

Sr. Cincinnato da Costa, the author of the above, goes on to describe the district where they are produced; the broad band along the River Douro and its tributaries, from Barca de Alva, on the Spanish frontier, to Barqueiros, which adjoins the region of Entre Douro e Minho. A viticultural district as remarkable for the disposition and nature of the soils on which they are planted as for the quality of the vine varieties which are mainly grown.

The number of different varieties is very considerable. The Visconde de Villa Maior, one of the best-known writers on the port wine region, considers the following 28 varieties to be best known and most widely grown:—†

Black Grapes.—Alvarelhão (including two sub-varieties), *Bastardo*, Casculho, *Cornifesto, Donzellinho* (three sorts), Entreverde, *Mourisco tinto*, Mureto, *Nevoeira*, Peagudo, *Souzão, Tinta amarella, Tinta carvalha*, Tinta castelloa, *Tinta francisca or franceza*, Tinta lameira, Tinta morella, Tinta pinhiera, *Tinta cão*, and *Touriga*.

White Grapes.—Codega or Malvasia grossa, Diagalves; Donna branca; Gouveio or Verdelho (two varieties); Malvasia, of which there are several sub-varieties; *Muscatel*, likewise; Rabigato or Rabo de Ovelha or Estreito.

It is rather curious that Grenache, which produces such remarkable sweet wines, both in Spain and in France, should not be included in the above list. It is grown in small quantity on the Douro, where it has long been known under the name of *Tinta Aragoneza*. Gyrão mentioned it as long ago as 1822, as being grown on the Douro, where it had proved a good bearer, but required a strong soil. It is very largely cultivated in another Portuguese province, that of Alemtejo, south-east of the Tagus River and along the Spanish frontier, but cannot in any sense be looked upon as a regular constituent of port wine.

In the following lines it is proposed to first deal with the three varieties mentioned by Mr. Burney, and afterwards to describe a few others which are of almost equal interest. It may be here mentioned that M. Richter's Portuguese correspondent was unable to obtain scions of Tinta cão

Alvarelhão.

This vine is described by Sr. Cincinnato da Costa as being one of the choicest black grapes grown on the Douro, where it is cultivated on a large scale in the sub-region of Baixo-Corgo, near Regua, where, in combination with Bastardo, it forms the basis of the composition of the best port wines. It is also to be met with in all this region as far as Barca d'Alva.

* *O Portugal Vinicola*, by B. C. Cincinnato da Costa.—This fine ampelographical work contains descriptions and life size illustrations of 94 Portuguese vine varieties.

† The names printed in italics are those of varieties described in detail in *O Portugal Vinicola* as being typical Douro varieties.

It is interesting to note that it has a good reputation as a quality variety, for the production of wines of totally different character to port, in other parts of Portugal, especially in the north, where the so-called green wines are grown. These are very light dry red wines of high acidity.

In Minho (extreme north of Portugal), especially at Amarante and at Basto, Alvarelhão, under the name of *Locaia*, is very much appreciated. Here it is cultivated on high overhead trellises or *uverias*, a mode of culture which causes the nature of the grape to differ considerably from that of the same variety, trained as a low vine in the centre of the hot Douro region. Nevertheless, the generous virtues peculiar to this vine are such that the wines of Basto are still held, and justly so, to be the best in the province of Minho.

In the province of Traz os Montes, Alvarelhão is well known under the similar name of Alvarelho.

According to Villa Maior there are, at least, two varieties; that which is called *pé roxo* (red foot) or *pé de perdiz* (partridge foot) is the best. The other, called *pé branco* or *verde* (white or green foot or stalk), being inferior. A third, with a still darker stalk, is sometimes distinguished, under the name of *pé preto* (black foot), but this is considered to be identical with the first.

Alvarelhão pé de perdiz is doubtless one of the best sorts cultivated in Portugal, by the qualities it communicates to the wine, and, in our opinion, it should, on this account, be much more propagated than it has so far been. It ripens towards the end of August or commencement of September, and is one of the sorts which ripen most regularly. Its bunches do not decay in wet years, nor do they fear drought much, especially in light soils. On heavier soils it produces abundantly. On the Douro it is trained low and pruned long. It is rather liable to oidium. At complete maturity, end of August, it gives, according to Villa Maior, 62 kilos. of juice per 100 kilos. of bunches, this juice containing .131 of acid (estimated as sulphuric) and 26.66 per cent. of sugar (14.4 Beaumé). It produces bunches of medium size, somewhat branched, usually 18 to 19 cm. (7 to 7½ inches) long. Its berries are of rather small size, oval, loose, detaching themselves readily from the stalk, and of a bluish tint, except a few which tend towards violet. The usual dimensions are 15mm. longitudinal by 13mm. transverse section (.59 in. x .51 in.). I have occasionally seen rather larger samples from Mirandella."

"In flavour this grape is very agreeably sweet, at the same time striking the palate by a *peculiar acidity, which gives it quite a characteristic piquancy, making* it most acceptable. It is generally used for wine making, though it is appreciated by some for the table on account of this peculiar flavour. The special quality of this variety caused Rebello da Fonseca to strongly recommend it, both as a scion for grafting and for new plantations, near Lisbon, in order to completely correct the flat after-taste, for which that author blamed the wines of this part of Portugal."

"The must of Alvarelhão is pale in colour; the yield of juice is fair—81 per cent. by weight—*100 kilos.* of grapes gave *74 litres* of liquid (*162.8* gallons to the ton). This was in 1899 vintage. Villa Maior held the yield to be less, or 62 per cent. (124 gallons to the ton). These discrepancies are not surprising, seeing how grapes from different localities may vary. Villa Maior estimates the sugar content at 26.6 per cent (about 14.4 Beaumé), whilst my analyses fix it at 21.5 per cent. (about 12.1 Beaumé)."

"*It has not been possible for me to study the wine made from this grape* alone; nevertheless, from what I know of the composition of the must I am led to think that Alvarelhão alone should give wines of excellent character, soft, *mellow claretes*[1], *of well-proportioned alcoholic strength and delicately aromatic*. If the wine is made by the process known as *de Feitoria*, as is the usual practice on the Douro, it should possess considerable freshness and grace, which will *be given to it by the high acidity of the skins. Whilst the acidity of the must*

[1] The word "clarete" is used in Portuguese to describe a light, dry table wine—a claret.

is usually about 2.5 to 3 per thousand (estimated as sulphuric), the acidity of the skin goes up to 5.8 per thousand.[2] . . . . The work of *feitoria* (trampling) causes the wine to benefit from this higher acidity of the skins, which thus raises the average acidity of the must.

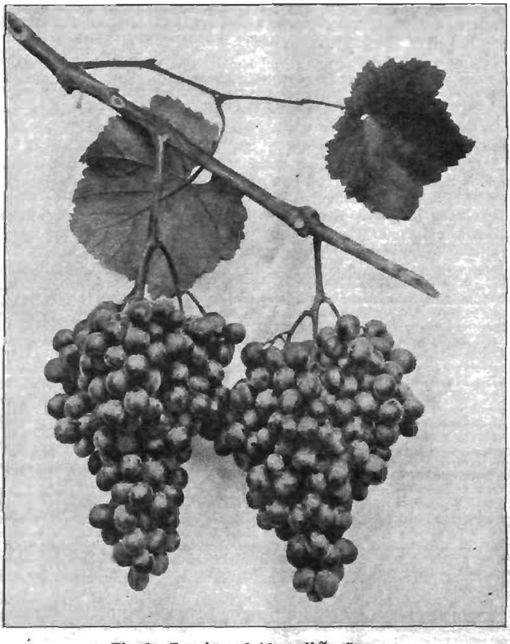


Fig. 1.—Bunches of Alvarelhão Grapes.

Reproduced from *O Portugal Vinicola*, by B. C. Cincinnato da Costa, reduced to .37 (approximately one-third) natural size.

A fact well in evidence in the case of this variety, which, however, has been also remarked to a greater or lesser degree in the majority of the varieties analyzed, is that the major part of the acid of the grape resides in the skin, the pulp coming next, and the stalks last, so far as acidity is concerned. Though further investigation is desirable to confirm this point, it seems to me to be one which should be duly weighed by wine-makers.[3]

[2] Estimated as tartaric acid, these figures would be respectively 3·8, 4·0, and 8·8 per mil.
[3] The foregoing quotations are from *O Portugal Vinicola*.

He then gives the ampelographical description which was drawn up by the Trasmontana (N. Portugal) Agricultural Station, which agrees on most points with that given in *Ampelographie*[4], which is reproduced.

Rebello da Fonseca, so long ago as 1791, states—"With the grapes known as Alvarelhão, *Pé agudo preto, Tinta cão,* and *Souzão is made* a strong wine of good colour and body, and with fine flavour. With *Bastardo and Donzelinho, mixed with the foregoing in small proportion,* the roughness of the Alvarelhão and Souzão is softened and sweetened, *and the fragrance of the bouquet is increased.*

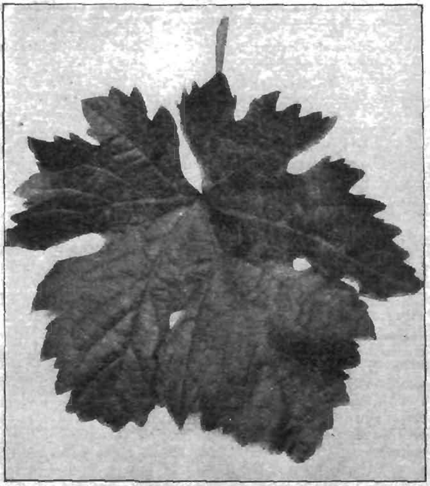


Fig. 2.—Leaf of Alvarelhão ·44 (approximately half) natural size.

Photo taken at the Rutherglen Viticultural Station, April, 1913.

He proceeds to discuss, at considerable length, the benefit to the Portuguese wine industry of the substitution of choice for common vines, and quaintly describes the curious flavour of Alvarelhão already referred to, explaining that "its juice is sweet, with a suggestion of roughness" (*pico azedo*) "similar to well-sweetened lemonade." This variety then formed the basis of the wines of the Alto Douro to such an extent "that with respect to all other red varieties together, Alvarelhão constituted three parts out of four."

[4] *Ampelographie*, published under the direction of P. Viala and V. Vermorel. A full description *is given of 5,200 distinct vine varieties, articles being contributed by leading authorities in all the* important wine-producing countries.

Gyrão (1822) recommends blending Alvarelhão with other sorts, and in not too considerable a proportion, since its wine is of poor colour. He nevertheless states that "it yields a wine of the most graceful piquancy (*do mais engraçado pico*) that one could have." He further states that this vine "and also Donzelinho de Castello are of such good quality that even laterals and suckers bear grapes, thus forming an exception to the rule." From this it would seem that even in case of damage by frost this variety would still yield some fruit.

Figuerido (1875) describes Alvarelhão as a grape-producing wine of quality (*Vinho fino*), of light colour, fairly astringent if made with thorough *feitoria* (trampling), which, with age, acquires precious qualities, developing into a most generous wine. From this grape, without addition of alcohol, and with little trampling, can be made a delicious light table wine (*Vinho de Pasto*)—the best that we know. . . . . . Its yield cannot be depended upon with as much certainty as that of Touriga; it gives a wine more open (lighter) in colour, very aromatic, and fairly alcoholic.

The description of Alvarelhão in *Ampelographie* is contributed by Sr. Duarte de Oliveira. He quotes from several of the authors whose works we have made extracts from, and gives some further information concerning this variety, from which the following is abridged:—

Alvarelhão is one of the oldest varieties in the regions of Douro and Tras os Montes, where it was formerly preferred in large vineyards on account of its always giving a very special character to the wine into the composition of which it entered. It certainly plays the principal part in the wines which have made the world-wide reputation of Port.

In Douro and Tras os Montes Alvarelhão is usually pruned long. In these regions it is a very good bearer, but in Minho it produces little unless pruned very long. Being very subject to *coulure* (faulty setting), its bunch contains many small seedless berries (*millerandé*) if blossoming occurs in damp foggy weather. Even if the fruit appears to set satisfactorily, the berries are liable to drop off afterwards (in this respect it seems to resemble Malbeck).

It is very liable to oidium, requiring much sulphuring; it is much less sensitive to downy mildew. In view of the exquisite delicacy of flavour it communicates, the wine-taster can immediately recognise it, even if present in small proportions, in a wine. . . . . . It causes Port wine to age, since it favours oxidization; thus, a wine containing some Alvarelhão in its composition might, at eight years old, be easily mistaken, as regards colour, for a wine of ten or twelve years.

The following ampelographical description is given:—

"*Vine.*—Vigorous, spreading grower; bark dark brown, with readily detachable grey strips; buds large, white, and downy; young growth whitish, with carmine edges.

"*Canes* of medium thickness, very long; wood hard and brittle; internodes fairly long (10-14 cm. = 4 to 5½ inches); striations well marked; of vinous red colour; buds medium; tendrils numerous and strong.

"*Leaves.*—Five-lobed, large, as broad as long, thick, hard to the touch, crisp, fleshy, bulged (between the veins); upper surface dark green, with traces of fine tomentum, resembling cobweb; under surface downy and of yellowish green; lateral lower sinus deeper than the upper; petiolar sinus deep, forming an elongated eliptical opening—main veins strongly marked and secondary veins prominent. Teeth almost equal, medium, slightly mucronate; terminal teeth large and of irregular form. Leaf stalk short, compressed for one-half of its length, and downy.

"*Fruit.*—Bunch fairly large, irregularly conical, usually loose, sometimes with one or two short wings; stalk long, wine coloured, somewhat herbaceous;

pedicels long, slender, with a pronounced warty swelling; berries medium, rather on the large side, ellipsoidal, dark, glossy, bluish black, juicy, and delicately perfumed; with short and weak brush[1]; skin hard, containing little colouring matter; juice very sweet and delicate."

Alvarelhão is very easy to identify, in view of its characteristic foliage, which differentiates it sharply from most other varieties, so that any one at all familiar with it can readily pick it out. One of its most striking characteristics is the peculiar funnel shape of the majority of the leaves; the midrib is often a continuation of the leaf stalk, the limb being rolled or twisted round; it is scarcely ever flat, nor can it be pressed so without a fold or crinkle. Though difficult to adequately portray without a stereoscope, this is fairly well shown in Fig. 2, and perhaps better in Fig. 3; it is also in evidence in the smaller leaf shown on Fig. 1. The ribbed and goffered texture of the substance of the

Fig. 3.—Vine of Alvarelhão at Quinta de Roriz, Alto Douro, Portugal.

Photo taken in October, 1907. The curious slate trellising posts are shown, also the terraced arrangement of the vine land. The stairway at the top right hand corner leads to a higher terrace.

leaf, between the secondary veins, is also characteristic; this is shown in Fig. 2. In colour, the leaves are dark green above and whitish beneath; the traces of cotton on the upper side and on the leaf stalks give a characteristic grey look to the whole vine, as though it had been lightly dusted with ashes, somewhat after the style of Pinot Meunier (Miller's Burgundy), though not to nearly the same extent.

From the above, two facts stand out. First—That Alvarelhão is in a large measure responsible for the peculiar character of Port wine. All connoisseurs are familiar with the curious "dry finish" of a true

[1] By "brush" is understood the fragment of pulp adhering to the pedicel when the berry is pulled off.

Port. Though the wine is distinctly sweet when first tasted, it leaves a dry and absolutely clean impression on the palate, and in this it differs radically from wines of Port type, which have as yet been produced in Australia. There seems good reason to believe that the peculiar acidity or roughness attributed to the Alvarelhão grape by most Portuguese writers is mainly responsible for this characteristic of this world-famed wine.

Second—That in order to extract the full measure of quality from Alvarelhão grapes, the *feitoria* (literally factory) method of wine making must be applied to it. This has been fully described in this *Journal* (March, 1908, p. 185). In brief, it consists in fermentation on the skins in shallow vats or *lagares* made of granite slabs; repeated tramplings by gangs of men with bare feet being given at intervals of

Fig. 4.—The "Feitoria" method of Port wine making. Trampling the grapes in shallow granite vats or "lagares" in the Alto Douro district, Portugal.

Reproduced from "Facts about Port and Madeira," by Henry Vizetelly.

from six to twelve hours during the whole course of fermentation. The wine remains on the skins usually from three to four days. Sometimes the stalks are wholly or partly removed, sometimes they are not removed at all. Without this repeated stirring the acidity and bitterness contained in the skins of the Alvarelhão grapes, so largely responsible for the leading characteristic of true Port, will not be properly extracted and communicated to the wine. (See Fig. 4.)

Is tramping with the feet really necessary? It would appear not. Duarte de Oliviera, in a quite recent work[2] on wine making, holds that the time-honoured *feitoria* method is merely a survival of ages past, and that it would be cleaner and better in every way to substitute repeated ramming and agitation with wooden rammers for trampling with the human foot.

[2] *Vinificacão*, by Pedro Bravo and Duarte de Oliviera.

(*To be continued.*)

FEEDING TERMS.

By B. A. Barr, Senior Dairy Supervisor.

Some Simple Explanations.

Simple definitions of the following terms used in stock feeding are offered with a view to assist a proper understanding of the importance of economical feeding, especially when it is necessary to make use of purchased foodstuffs. High prices for dairy stock are likely to be maintained for many years. The prices of dairy produce will be regulated, when normal conditions again obtain, by the world's supply and demand. The farmer cannot regulate the price of dairy produce in proportion to the cost of dairy cows, but attention may profitably be given to increasing the production, and, at the same time, lessening its cost. In other words, dairy farming should be specialized. One method of lessening the cost of production is to remove all cows which do not pay for feed and attention; and another is to increase the supply of food as long as an adequate profit is returned.

Protein.

Protein is a term applied to a group of substances present in varying amounts in all foodstuffs. It is composed of the elements carbon, hydrogen, oxygen, and nitrogen, frequently sulphur, and sometimes phosphorus and iron.

Protein in the food is essential to the building up of flesh, and to milk secretion. The albumen and casein, or curd of milk, are proteins, and the greater the amount of milk yielded the greater will be the amount of protein required in the food. In common cattle foods linseed and coconut oil cake contain the largest amounts; then follow gluten feed —polly meal, pollard, bran, oats, crushed maize, green lucerne, clover, mixed grasses, green oats, barley, and maize.

The proteins form a very extensive group, and the protein of each particular grain of fodder is different in some characteristic from that contained in a different species or kind of food. Partly for this reason, a mixed ration is desirable, insomuch as a combination of foodstuffs will insure the presence of all necessary groups, whereas a single feed might be deficient in an essential group. Also, the food value of the protein varies, that present in the grains and mill products—bran, &c.—being greater than that contained in hay, green fodder, and roots.

The animal can only utilize economically sufficient protein to repair the wastage of tissues to promote growth, and to provide for milk secretion. In ordinary feeding, any excess above these requirements is passed off unused. An average dairy cow requires about .5 lb. of digestible protein daily for maintenance, and, in addition, .04 lb. for each pound of milk. Nevertheless, in making up a ration for milking cows, it is inadvisable to restrict the protein content to the theoretical amount, for two reasons:—(1) The food values of foodstuffs vary within wide limits; (2) a slight excess of easily digestible protein possesses a stimulating effect on milk secretion.

When applied to cattle foods, protein, albuminoids, and nitrogenous substances are synonymous.

Carbohydrate.

The term carbohydrate is given to a large group of compounds chemically related. They are composed of the elements carbon, hydrogen, and oxygen, and to this class belong sugars, starches, gums, cellulose, &c. In the animal body, carbohydrates are used for the production of energy and heat, and any excess is converted into body fat.

Unlike protein, any excess of carbohydrates over immediate requirements is not passed off unused, but is stored as a reserve in the form of fat.

Carbohydrates cannot replace protein, although protein may replace carbohydrate, but only at a high cost.

In the analysis of cattle foods, the term carbohydrate is given to the combined amounts of nitrogen free extract and crude fibre, and, although the estimation is not purely carbohydrate, no appreciable error is made by giving it an average carbohydrate value.

Fat.

Crude fat, or ether extract, although some of the members of this group consist of the same elements C.H.O. as the carbohydrate, they differ chemically. The ether extract sometimes includes, besides fat or oils, wax, chlorophyll, which are without feeding value, consequently, the food value of the ether extract is dependent upon its source. That obtained from oil cakes, grains, and their offals, give a higher value than that obtained from hays or green fodders. The digestible portion of the ether extract serves the same function as the carbohydrate, but its capacity for heat production is much greater, pure fat having two and a half times the value of carbohydrate. The crude fat or ether extract of oil cakes, grain, bran, &c., possesses a capacity for heat production two and two-fifths times greater than carbohydrate, whereas the fat estimation of hays and green fodders is only about twice the value of carbohydrate.

Nutritive Ratio.

The nutritive ratio, or N.R., of any food means the ratio of the protein content to the carbohydrate and ether extract combined; the ether extract is reduced to its starch equivalent. The nutritive ratio of any food, or combination of foods, is a most important factor in determining its efficiency.

Milking cows yielding up to 3½ gallons daily are most economically fed on a ratio with a N.R. of 1 to 6 or 7, which is the ratio of good mixed pasture grass; but for heavy milkers yielding 4 gallons and over, the ratio may be effectively reduced to 1 to 5, which means that for each part of digestible protein, there are 6, 7, or 5 parts of carbohydrate respectively.

In practice, the N.R. of any ration is valuable when purchased foods are used, because it shows in what proportions the constituents should be combined to produce the best return. Both money and feed may be wasted by disregarding its value. When the N.R. is too wide, the food is deficient in protein, and consequently not sufficient protein is ingested to meet the needs of the animal, whilst at the same time the digestibilit

of the food is depressed. Maize (green) is an example of a food with a *wide ratio*, there being 1 part of protein to 12 of carbohydrates. When the ratio is too narrow, protein is wasted, because the amount of food consumed under general conditions contains a greater amount of protein than the animal can utilize.

An average milking herd requires food possessing an average ratio of 1 to 6 and 1 to 7. When the amount of carbohydrate is greater, the ratio is wide; when less, narrow.

Examples of foods, with their ratios:—

Wide N.R.		Narrow N.R.	
Green maize ...	1 : 12.	Green lucerne ...	1 : 3.
Oaten hay ...	1 : 11.	Bran	1 : 4.
Oaten straw ...	1 : 46.	Linseed meal ...	1 : 2.
Potatoes ...	1 : 18.	Brewers' grain ...	1 : 3.

The use of any of these foods alone results in considerable waste, and is *not conductive to an economical return*; *but a combination* of the above foods provides, not only the necessary food substances, but contains them in that proportion which produces the most economical return.

Balanced Ration.

A combination of foods in that proportion which gives the best results for any particular purpose. Some of the above-mentioned foods, when combined in the following proportion, form a balanced ration for an average milking herd:—

Maize ..	40	Bran	4	Chaff	10	Lucerne Hay ..	12
Bran ..	10	Green Lucerne ..	15	Linseed Meal ..	1	Maize.. ..	50
Chaff ..	5	Maize	40	Brewers' Grain ..	20	Bran	10

The amounts fed are determined by the quantities of milk secreted. It *must not be inferred that, when some of the above feeds are fed alone*, good returns are not attained, but a combination increases the yield, and at the same time decreases the cost of production when market values are given to home-grown crops, or when purchasing.

Concentrates.

A term applied to foodstuffs relatively rich in easily digestible food substances, as oil cakes, grains, bran, and mill products. Lucerne hay—*although popularly regarded as such—is not a concentrate in the above* definition, owing to the high cost of digestion. It should be used as a bulky feed, and, when farm-grown, should be provided in large *quantities*.

Maintenance Ration.

That amount of food required to maintain a non-producing animal in a *healthy condition*.

In any system of feeding, the first demand is made for maintenance; what is available over this requirement can be used for work or milk production. *In feeding milking cows, the maintenance part of the ration* is most cheaply supplied by bulky foods, such as hays, and green fodder. That part to be used for milk secretion is best provided by easily digestible concentrates.

Digestible Nutrients.

For the purpose of determining the relative food values of foodstuffs, each is analyzed to determine the percentages of protein, carbohydrate, and crude fat or ether extract. This process gives the total amounts present, but does not indicate the food value of the substance.

To ascertain its nutritive properties, the palatability and digestibility are determined by feeding it either alone or in combination with other foods of known value and digestibility, for a period of several days, to animals—in this case, to cows. The manure is carefully collected, weighed, and analyzed, and the difference between that contained in the original food and manure represents what has been digested and is available for the animal's use.

DIGESTIBILITY OF SILAGE.

With regard to the question of the digestibility of silage against that of the original crop from which it is produced, it is generally recognised, according to a note by Messrs. Guthrie and Ramsay in the Government agricultural publication of New South Wales, that it is about the same as that of dried fodder (hay), both silage and hay being slightly less digestible than the original green fodder. This low digestibility is not due to any actual decrease of indigestible material, but to the fact that there is always a considerable loss in the conversion of the green crop into hay or silage (apart from the loss of water), and that this loss chiefly consists of sugar and similar soluble substances which are wholly digestible. A loss of as high as 20 per cent. of material is possible in the conversion of green crop into silage, and the material so lost is for the most part the digestible portion of the fodder. On the whole, there is less loss of material when the crop is converted into silage than in the case of field-cured crops, and the silage, if properly prepared, is much more succulent and palatable to stock. If the fodder in drying is exposed to rain, a very considerable loss of material results; whereas in the conversion into silage, such conditions can be avoided.—*Auckland Weekly News*, 24th February, 1916.

RADIUM AS A FERTILIZER.

For the past two years experiments have been instituted at Reading, England, to investigate the power of radium as a fertilizer. As a result of the above experiments it is made clear that while in some cases plants dressed with radio-active ore have given better results than the control plants, the improvement has not been of such a nature as to warrant the assumption that so expensive a commodity as radium could be profitably applied to crops. Accepting these investigations as conclusive, the farmer and gardener, says the *Times*, need look for no material benefit from radium.

The chief result has been to emphasize the value of farmyard manures and artificial fertilizers.—Extract from current Industrial News. *Journal of Ind. and Eng. Chem.*, December, 1915.

TREE-PLANTING COMPETITION.

In 1912, a tree-planting competition was arranged by authority of the Cabinet, acting on proposals submitted by the Lands Department. For the working out of the details of the scheme, a special committee was constituted, comprising the horticultural representatives of the *Australasian*, *Leader*, and *Weekly Times* papers, the Secretary for Lands, the Conservator of Forests, and the Curator of the Botanic Gardens. The State was divided into five large divisions, having regard to physical and climatic conditions, and two further divisions—"small holdings dry" and "small holdings irrigated."

For each of the first five divisions, the prizes offered were—1st, £60; 2nd, £25; 3rd, £15; and 1st, £25; 2nd, £15; and 3rd, £10, for each of the two small holdings; a gold medal being awarded to every winner of a first prize. Very wide publicity was given to the scheme, through the generous help rendered by the entire press of the State, the full details being published and given great prominence. The total number of entries accepted was 111, being fewer than were expected. A very complete list of trees suitable to the various divisions, and classified according to their value for (*a*) shelter, shade, and wind-breaks; (*b*) timber supply; (*c*) ornamental and other purposes, was compiled by the Committee and freely circulated. The period over which the competition extended was three years.

At the end of the first year, all competitors were asked by circular letter for a report, and it was then found that, as a result of the unfavorable season of 1912-13, a good many of the attempts had not given satisfactory results, and a number of the competitors withdrew. The withdrawals included all those who had entered for competition in Division 1, "Mallee Country," and Division 5, "Hill Country." A review of the work of the remaining growers—five divisions—has now been completed by Mr. J. Cronin (Director of Botanic Gardens). His report shows that a greater measure of success has attended the project than is actually revealed by the prize plantations. Failure, in some cases, inspired renewed effort, and a measure of experimentation. It is considered by the Committee that valuable object-lessons are now provided in the widely-distributed localities, and that tree-planting, as an aid to settlement, will be encouraged thereby. There are evidences throughout the State of increasing interest in this good work, to which the tree-planting competition has materially contributed, and it is being further assisted by the Arbor Day celebrations.

Mr. Cronin reports:—"As a result of my investigations, I place the competitors in the following order:—

DIVISION 2.

A. Holland ..	.. Avon Plains	.. 1
W. Cornish ..	.. Lake Boga	.. 2
E. Newnham ..	.. Nagambie	.. 3

DIVISION 3.

J. W. Grubb ..	.. Traralgon	.. 1
C. C. Rossiter ..	.. Hedley	.. 2
S. N. Francis ..	.. *Coleraine*	.. 3

Division 4.

E. Bell, Jun. ..	.. Mockinya	.. 1
J. Bosisto & Co. ..	.. Emerald	.. 2

Division 6.

Mrs. M. Tredrea ..	.. Cooma	. 1
T. Lee Bake ..	.. Swan Hill	.. 2
D. J. Corboy ..	.. Shepparton	.. 3

Division 7.

E. C. Pettett ..	.. Glenorchy	.. 1
Mrs. E. Tehan ..	.. Millgrove	.. 2
S. Matchett ..	.. Iona ..	.. 3

I consider that the competitors named should be awarded the prizes offered by the Government, and that in each case the plantation is worthy of the prize recommended."

This report has been adopted by the Committee, and the prizes awarded accordingly.

(Signed) Joseph Harris.
Jno. Callander.
D. M. Dow.
J. M. Reed.
H. Mackay.
J. Cronin.

Mr. Cronin further reports:—

"The plantations inspected were situated in widely different parts of the State, including Coleraine, Skipton, Horsham, Avon Plains, Swan Hill, Shepparton, Cooma, Welshpool, Traralgon, &c., and, as might be expected, most of them were situated at some distance from the towns. The soils and climatic conditions were also widely different in character. In forming their plantations, the owners had generally accepted the lessons of earlier plantings, and had used the 'Sugar Gum' and 'Monterey Pine' very liberally for the purpose. Outside of these, the range on the whole was fairly wide, a few trees of several genera and species being selected, in some cases as an experiment, in others to afford some variety and ornamental effect. The most conspicuous failure was the 'Monterey Cypress' (*Cupressus macrocarpa*) and its varieties, a result probably largely due to drought, but in more than one case traceable to the trees having been planted in holes dug into the subsoil. In every case where this was done the trees of all kinds were comparative failures, and a similar result followed planting in low, undrained situations. The best trees were always found in high and well-drained places, where the initial cultivation was shallow but thorough. In most places these trees are now quite safe, except in case of fire. The plantations visited were all fenced, and in most places the young trees had been attended to in the matters of training, cultivation, &c. In only one case was evidence given of the use of manure. Some trees of *Eucalyptus calophylla* were so large that I expressed doubt as to their age. The owner proved that the trees were planted in 1912, but stated that he had manured them, giving each a handful of gypsum at planting.

A brief note respecting the nature of the plantations of the successful competitors may be of interest.

A. Holland, 1st in Division 2, has planted twelve plantations of 'sugar gums' and one of 'pepper trees' around a small water reserve and at his house at Avon Plains, 20 miles from St. Arnaud. These trees have all made fine growth, and are quite a feature in a bare, treeless district. Pines and other trees had been previously planted, but entirely failed to grow. The plantations total 15 acres, and the gums are about 15 feet in height. (It is stated that the sugar gums were first planted in this portion of Victoria in 1885 by the late John Crewar, who obtained the seeds from the South Australian Government. The plants from these seeds are still thriving, and are very fine specimens.)

J. W. Grubb, Traralgon, 1st in Division 3.—The plantations consist of lines around various paddocks, a patch of about 3 acres for timber, and specimens for ornament and shelter. *Pinus insignis* and *P. canariensis* have been planted about 30 feet apart on the boundary lines, with *Eucalyptus botryoides* midway between. The pines have made fine growth, but the gums have suffered from insect attacks. They are all growing, and may do well now. The timber patch is planted with pines, sycamores, peppermints, and box, set out 6 feet apart. The specimen and ornamental trees are very different in character and are doing well.

C. C. Rossiter, Hedley, 2nd in Division 3.—The property of this competitor was a dense tea-tree swamp eight years ago. It is now all drained and cleared, except for a few patches of the tea-tree left for stock shelter, but these are steadily dying out. The owner planted *Pinus insignis* about seven years ago, and a fine shelter belt now exists. A new plantation of 8 acres was formed for the competition, and *Pinus insignis* was liberally planted. These trees are all thriving. *Cupressus macrocarpa*, too, is doing fairly well here, but eucalypts of various species have been tried and have failed. Acacias and a few oaks are growing satisfactorily. A short hedge of about 100 feet of 'Murray Pine,' *Callitris rhomboidea (cupressiformis)*, is most satisfactory, and forms, without any trimming, a dense screen about 7 feet high and beautiful in its deep green colouring. The pine and other trees have all been pruned to a clean stem to allow of sheep being placed in the enclosures to feed off the grass as a protective measure against fire.

E. Bell, Jun., 1st in Division 4.—The place is situated at Mockinya, about 25 miles from Horsham, where some 20 acres of sandy land have been planted, principally with black wattles and sugar gums. Although there was no great variety of plants here, they had been carefully cultivated, and were all in good condition.

Mrs. M. Tredea, 1st in Division 6.—A small farm situated at Cooma, about 13 miles from Tatura, and placed in the section for 'small holdings irrigated.' Gums of several kinds have been planted in lines around various small paddocks. *Pinus insignis*, willows along the channels and in a slight depression, and acacias of many species have also been planted, together with a wide selection of other trees. This is a most satisfactory plantation, and would be difficult to surpass. The whole of the trees have made excellent growth, have been properly attended to, and have been planted with good judgment.

E. C. Pettett, 1st in Division 7.—This competitor owns a small farm of 40 acres at Warra Warra, about 8 miles from Glenorchy. He is an apiarist, and has planted trees for the competition that produce pollen and honey for his bees. Hitherto he has been compelled to move his bee-hives as pollen or honey became scarce, but says that now he can depend on a supply of both from his plantings. The plantation acts as a breakwind and shelter, and is decidedly ornamental also. Gums of various species, *E. Calophylla, ficifolia, cornuta, corynocalyx*, &c., have all made very fine growth, as indeed have all the trees on the place. Acacias of several kinds are thriving equally with the eucalypts, viz., *A. decurrens, A. normalis, A. Baileyana, A. cultriformis*, and others doing well, but the severe frost experienced at times is too much for *Acacia elata*, which has been cut back repeatedly. Tagosaste, broom, and other bee-feeding plants have also grown well.

I have to say, in conclusion, that the arrangement of the competitors in the various divisions was made with a thorough knowledge of the conditions of the various parts of the State. After fully considering the matter on the ground, I know of no single instance where a competitor should have been placed in a different division to that allotted to him or her."

Tree List for the various Divisions, as prepared by the Committee.

Divisions 1 and 2.

MALLEE COUNTRY AND DRY NORTHERN COUNTRY.

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Currajong Tree (*Sterculia diversifolia*).
Bull Oak (*Casuarina glauca*).
Black Box (*Eucalyptus bicolor*).
Sugar Gum (*Eucalyptus corynocalyx*).
White Ironbark (*Eucalyptus leucoxylon*.)
Red Ironbark (*Eucalyptus sideroxylon*.)
Silky Oak (*Grevillea robusta*).

EXOTIC TREES.

Monterey Cypress (*Cupressus macrocarpa*).
Olive (*Olea Europœa*).
Aleppo Pine (*Pinus Balepensis*).
Monterey Pine (*Pinus insignis*).
Locust Tree (*Robinia pseudacacia*).
Pepper Tree (*Schinus Molle*).

Timber.

AUSTRALIAN TREES.

Bull Oak (*Casaurina glauca*).
Black Box (*Eucalyptus bicolor*).
Sugar Gum (*Eucalyptus corynocalyx*).
White Ironbark (*Eucalyptus leucoxylon*).
Red Ironbark (*Eucalyptus sideroxylon*).
Silky Oak (*Grevillea robusta*).

EXOTIC TREES.

Monterey Cypress (*Cupressus macrocarpa*).
Monterey Pine (*Pinus insignis*).

Ornamental or other purposes.

AUSTRALIAN TREES.

Cootamundra Wattle (*Acacia Baileyana*).
Cedar Wattle (*Acacia elata*).
Golden-rain Wattle (*Acacia prominens*).
Victorian Laurel (*Pittosporum undulatum*).

EXOTIC TREES.

Box Elder or Manitoba Maple (*Acer negundo*).
Oleander (*Neriums*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).

Division 3.

SOUTHERN COUNTRY (COASTAL, PLAIN, AND UPLAND).

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Gippsland Mahogany (*Eucalyptus botryoides*).
Yate (*Eucalyptus cornuta*).
Sugar Gum (*Eucalyptus corynocalyx*).
Yellow Box (*Eucalyptus melliodora*).
Coastal Tea Tree (*Leptospermum laevigatum*).

EXOTIC TREES.

Monterey Cypress (*Cupressus macrocarpa*).
Nepaul Cypress (*Cupressus torulosa*).
Olive (*Olea Europæa*).
Canary Island Pine (*Pinus Canariensis*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Pine (*Pinus insignis*).
Pepper Tree (*Schinus Molle*).

Timber.

AUSTRALIAN TREES.

Sugar Gum (*Eucalyptus corynocalyx*).
Yate (*Eucalyptus cornuta*).
Yellow Box (*Eucalyptus melliodora*).
Red Ironbark (*Eucalyptus sideroxylon*).
Forest Red Gum (*Eucalyptus tereticornis*).

EXOTIC TREES.

Canary Island Pine (*Pinus Canariensis*).
Monterey Pine (*Pinus insignis*).
Corsican Pine (*Pinus laricio*).

Ornamental and other purposes.

AUSTRALIAN TREES.

Cootamundra Wattle (*Acacia Baileyana*).
Green Wattle (*Acacia decurrens*, var. *normalis*).
Cedar Wattle (*Acacia elata*).
Acacia longifolia, var. *sophoræ*.*
Golden Wattle (*Acacia pycnantha*).
Willow Wattle (*Acacia saligna*).
Norfolk Island Pine (*Araucaria excelsa*).
West Australian Red Gum (*Eucalyptus calophylla*).
Scarlet Flowering Gum (*Eucalyptus ficifolia*).
Eugenias of sorts.
Victorian Laurel (*Pittosporum undulatum*).
New South Wales Brush Box (*Tristania conferta*).

EXOTIC TREES.

White Mulberry (*Morus alba*).
New Zealand Flax (*Phormium tenax*).
Tamarisks of sorts.
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).
Lime or Linden Tree (*Tilia Europæa*).

Division 4.

HILL COUNTRY (NOT HEAVY FOREST).

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Peppermint Gum (*Eucalyptus amygdalina*).
Gippsland Mahogany (*Eucalyptus botryoides*).
Sugar Gum (*Eucalyptus corynocalyx*).
Yellow Box (*Eucalyptus melliodora*).
Red Box (*Eucalyptus polyanthemos*).
Victorian Laurel (*Pittosporum undulatum*).

EXOTIC TREES.

Lambert's Spreading Cypress (*Cupressus Lambertiana*, var. *horizontalis*).
Monterey Cypress (*Cupressus macrocarpa*).
Nepaul Cypress (*Cupressus torulosa*).
Canary Island Pine (*Pinus Canariensis*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Pine (*Pinus insignis*).
Yellow Pine (*Pinus ponderosa*).
Mammoth Tree (*Sequoia gigantea*).

Timber.

AUSTRALIAN TREES.

Blackwood (*Acacia melanoxylon*).
Sugar Gum (*Eucalyptus corynocalyx*).
Blue Gum (*Eucalyptus globulus*).
New South Wales Blackbutt (*Eucalyptus pilularis*).
Forest Red Gum (*Eucalyptus tereticornis*).

EXOTIC TREES.

Canary Island Pine (*Pinus Canariensis*).
Monterey Pine (*Pinus insignis*).
Corsican Pine (*Pinus laricio*).
European Ash (*Fraxinus excelsior*).

* Particularly suitable as a sand-stay.

Ornamental and other purposes.

AUSTRALIAN TREES.

Cootamundra Wattle (*Acacia Baileyana*).
Green Wattle (*Acacia decurrens*, var. *normalis*).
Cedar Wattle (*Acacia elata*).
West Australian Red Gum (*Eucalyptus calophylla*).
Scarlet Flowering Gum (*Eucalyptus ficifolia*).
Red Flowering White Ironbark (*Eucalyptus leucoxylon*, var. *rosea*).

EXOTIC TREES.

Sweet Chestnut (*Castanea sativa*).
Common Walnut (*Juglans regia*).
Bead Tree or White Cedar (*Melia Azedarach*).
New Zealand Flax (*Phormium tenax*).
Pin Oak (*Quercus palustris*).
White Oak (*Quercus alba*).
Portugal Oak (*Quercus lusitanica*).
Lime or Linden Tree (*Tilia Europæa*).
English Elm (*Ulmus campestris*).
American White Elm (*Ulmus Americana*).
White Mulberry (*Morus alba*).

Division 5.

HILL COUNTRY (FORMERLY FOREST, MORE OR LESS CLEARED AND OLD TIMBER KILLED).

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Apple Tree (*Angophora intermedia*).
Satin Box (*Eriostemon squameus*).
Sugar Gum (*Eucalyptus corynocalyx*).
Gippsland Mahogany (*Eucalyptus botryoides*).
Victorian Laurel (*Pittosporum undulatum*).

EXOTIC TREES.

Monterey Cypress (*Cupressus macrocarpa*).
Nepaul Cypress (*Cupressus torulosa*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Pine (*Pinus insignis*).
Yellow Pine (*Pinus ponderosa*).

Timber.

AUSTRALIAN TREES.

Blackwood (*Acacia melanoxylon*).
Mountain Ash (*Eucalyptus amygdalina-regnans*).
Blue Gum (*Eucalyptus globulus*).
Yellow Stringy Bark (*Eucalyptus Muelleriana*).
Messmate (*Eucalyptus obliqua*).

EXOTIC TREES.

Canary Island Pine (*Pinus Canariensis*).
Monterey Pine (*Pinus insignis*).
Corsican Pine (*Pinus laricio*).

Ornamental and other purposes.

AUSTRALIAN TREES

Cootamundra Wattle (*Acacia Baileyana*).
Green Wattle (*Acacia decurrens*, var. *normalis*).
Cedar Wattle (*Acacia elata*).
Golden-rain Wattle (*Acacia prominens*).
West Australian Red Gum (*Eucalyptus calophylla.*)
Scarlet Flowering Gum (*Eucalyptus ficifolia*)

EXOTIC TREES.

Sweet Chestnut (*Castanea sativa*).
Cape Chestnut (*Calodendron capense*).
White Mulberry (*Morus alba*).
New Zealand Flax (*Phormium tenax*).
Pin Oak (*Quercus palustris*).
Portugal Oak (*Quercus lusitanica*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).
Lime or Linden Tree (*Tilia Europæa*).

Divisions 6 and 7.

SMALL HOLDINGS.

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Gums (*Eucalypts*) of kinds, according to locality (*vide* other lists).

EXOTIC TREES.

Monterey Pine (*Pinus insignis*).
Monterey Cypress (*Cupressus macrocarpa*).
Olive (*Olea Europæa*).
Loquat (*Eriobotrya Japonica*).
Pepper Tree (*Schinus Molle*).
Victorian Laurel (*Pittosporum undulatum*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).

Ornamental and other purposes.

AUSTRALIAN TREES.

Wattles (*Acacias*) of kinds, according to locality (*vide* other lists).

EXOTIC TREES.

Walnut (*Juglans regia*). Bead Tree (*Melia Azedarach*).
Camphor Tree (*Cinnammomum Camphora*). New Zealand Flax (*Phormium tenax*).

PROPAGATION METHODS.

Every settler should have a small plot for the raising of his own trees. The following are some general methods which may be adopted for the sowing of tree seeds, viz.:—

1. *Indiscriminate or Broadcast Sowing.*—

(*a*) The area where the seed is to be sown should be in such a condition that the seed, when scattered, will find a ready lodgment either in the soil or in decaying vegetable matter suitable for inducing germination, and providing the necessary light, moisture, and nourishment for the future plants to establish themselves.

(*b*) The area may be scarified or ploughed and harrowed, being worked to a fine tilth, before sowing, if its natural condition is not suited for the reception of the seed.

Sugar Gum Plantation, 2¼ Years Old.

2. *Sowing Seeds in Drills.*—

If necessary, the plough or a drilling machine may be run lightly along the lines where the seed is desired to be sown. This will allow light and moisture to penetrate the drills and stimulate the germination of the seeds.

After sowing the seeds, they may be lightly covered with some friable soil, or the rake may be very lightly drawn along the drills, with the object of covering the seeds, which may then be gently pressed down with the foot.

3. *Seed Sowing in Prepared Open Beds or Shaded Frames.*—

The beds should be formed in some slightly sheltered position. The soil should be of two-thirds peaty or sandy nature and one-third of good loamy character. After thorough preparation and levelling of the beds, the seeds may be sown and lightly covered with fine soil and carefully hand-watered with can. When the seedling plants have developed, care must be taken not to allow them to become either too dry or over moistened.

It is sometimes an advantage to have the beds formed in frames or framed around thus:—

Front View. End View.

so as to allow of calico-shading being rolled up or down, in order to provide for the protection of beds during unfavorable weather.

4. *Seed Sowing in Pots, Pans, or Flat Boxes.*—

The receptacles should be well drained. Use similar soil and exercise the same care as in the case of seed sowing in open beds.

Note.—In all cases of seed-sowing, the general practice may be adopted of covering the seeds with suitable soil to a depth corresponding to the size of the seeds.

Sugar Gums and Pepper Trees at Mildura—12 Years after Planting.

SOWING OF PINE SEEDS.

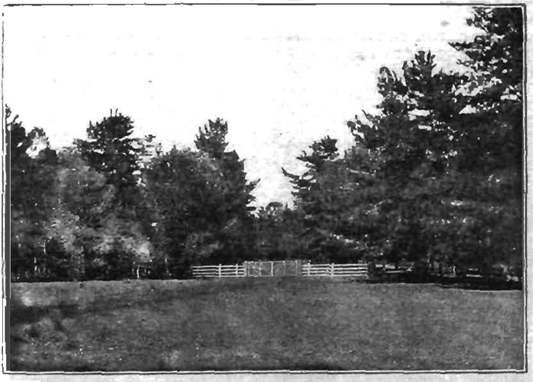
The ground should be well dug, lined out in 4 or 5 ft. beds, and then raked to a fine surface. The pine seeds should be soaked in cold water, and allowed to swell. The water should then be drained off, and the

seed placed under cover for a few hours. Drill lightly the beds in three or four lines, and sow the seed straight away in the drilled lines, and cover up with the back of a light rake. If the soil is dry, water well with watering can and fine rose, and keep the ground moderately moist. In ten or eleven months' time the seedling plants should be lifted, and transplanted in nursery lines, 3 to 4 in. apart and from 14 to 18 in. between the rows. In this position they can remain for one or two years. They will then be large enough to remove to their permanent quarters.

The sowing should be done during August and September, but this depends on the season and district, the northern areas being first planted. In 1 lb. weight of pine seed there are from 19,000 to 90,000 seeds.

THE RAISING OF GUMS.

Sowing in Beds and Boxes.—The seed can be sown from September to November, in open beds, boxes, pots, or pans. If in open beds, in the



Pine Trees and Gums, Titanga Estate, Lismore—18 years after planting.

absence of a cement bottom something in the shape of hardwood boards or sheet-iron should be laid 7 or 8 in. below the surface to prevent the roots of the seedling gums from going down. The seed beds should be from 3 to 4 ft. wide, with a fine smooth surface. Water the bed before sowing. Sow broadcast, and spread some finely sifted loamy soil, light and dry, with a little decayed leaf mould mixed lightly and evenly over the seed; then water with a fine rose. A temporary screen over the beds will assist the seed and protect the plants.

If boxes are used they should be from 4 to 6 in. deep, with holes in the bottom for drainage. When filling the boxes, pots, or pans, place over the holes (for open drainage purposes) curved pieces of crocks or charcoal. Fill in with moderately-sifted loamy soil to within 1½ in. of the top; water, sow, and cover the seed as directed for the open beds. As plants in boxes are liable to be drawn, great care must be taken to

keep them exposed to the light, and only shade when required. The seed will cost from 1s. 6d. to 2s. 6d. per ounce.

Sowing in Belts.—Where this can be done it is the cheapest and best. In rangy country, where there are steep slopes thickly dotted with tree stumps and outcrops of rock, and the surface is a tangle of roots, nursery growth must be planted. Where the soil is free from obstacles of this kind, seed planting can be proceeded with. The nature of the surface and subsoil should be understood, as on this will depend the depth of the ploughing. A good shallow surface must not be buried or mixed out of proportion with a stiff clay subsoil, that will run together in wet weather, and bake into a hard crust in summer. If the subsoil is free, open, and porous, plough deeply, and work it up to a fine tilth.

Mix the gum seed with dry sandy loam, well sifted, and sow by hand broadcast out of a dish, seed bag, or box. Then pass a light harrow over it. This done, the success of the crop will depend on the season. For this work May, August, and September months are the best. On the climate and district will depend the month selected for the work. As the trees advance in growth thin out, and allow them growing space. A mixed sowing should not be done unless the cultivator understands the nature and habit of the trees he is about to mix.

Fence off with a temporary dropper fence. The seed, cultivation, and fence will cost from £2 5s. to £3 5s. per acre, that is, when the planting is done along a permanent boundary fence.

Preparing the Ground and Planting.

Take out square holes 12 x 12 or 24 x 24 in. wide, and the same in depth; place the surface soil on one side of the hole, and the subsoil on the other. For shelter planting on exposed sites the holes should be 8 ft. apart; thin out as the trees grow. When the soil is pulverized, and not too wet or too dry, and the holes free of water, fill in by placing the soil as it was taken out. Should the subsoil be poor, mix a little surface soil with it. For planting select dull weather. Dry winds are injurious to plants out of the ground; avoid removing them. For planting it is better that two persons should be employed at the work. When root space is made in the centre of the filled-in hole by one man, the other can place the tree in its position from beneath a cover, and steady it while the fine earth is being filled in and pressed gently round.

Pines, cypresses, &c., should be planted out in June or July, and not later than August. In warm districts, where frosts are not severe, gums (if properly hardened off) can also be planted. They will then be well established before the hot weather sets in. In cool districts, where frosts are severe, gums should not be set out until all danger is past. In lifting the gums for transplanting, great care must be taken not to injure or expose the roots. Allow as much earth as possible to remain on the roots; on gums every root is required. If reduced when transplanted into a new soil and position, the remaining roots will be unable to supply the stem and foliage with sufficient moisture. Hence, so many deaths, through the moisture passing away from the stem growth faster than the roots can supply the sap waste. Gums should be planted out in their permanent place when young and small, say, from four to twelve months old.

Great care should be taken to exclude all stock from the plantations. As rabbits do great injury to many of the seedling trees and plants wire netted fences will be a necessity in most localities.

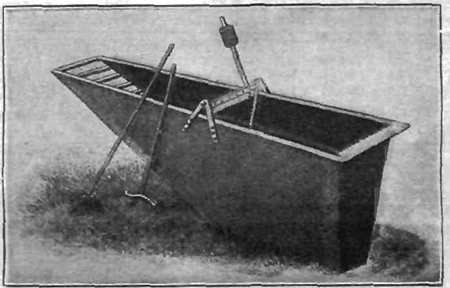
SHEEP DIPS.

By A. W. Curlewis, Inspector of Stock.

The following particulars and plans of a few sheep dips which have given satisfaction to those using them may be of interest to sheep-owners and others intending to construct dips this year:—

No. 1.—For small flocks only.—This is a portable iron dip used at Longerenong College, among other places, and described in a former issue of the *Journal* by Mr. G. A. Sinclair, Principal of the College, as under:—

"The plan adopted at this institution is for small flocks only, and about 800 sheep per day can be put through comfortably and thoroughly. We are indebted to a well-known Tasmanian sheep breeder, Mr. F. Burbury, of Ashgrove, for the general idea of the yards, and the details worked out here may be useful to many at this juncture. Experience has shown that there are objections to the usual style of dipping yards with a long race often leading upwards and thus entailing much

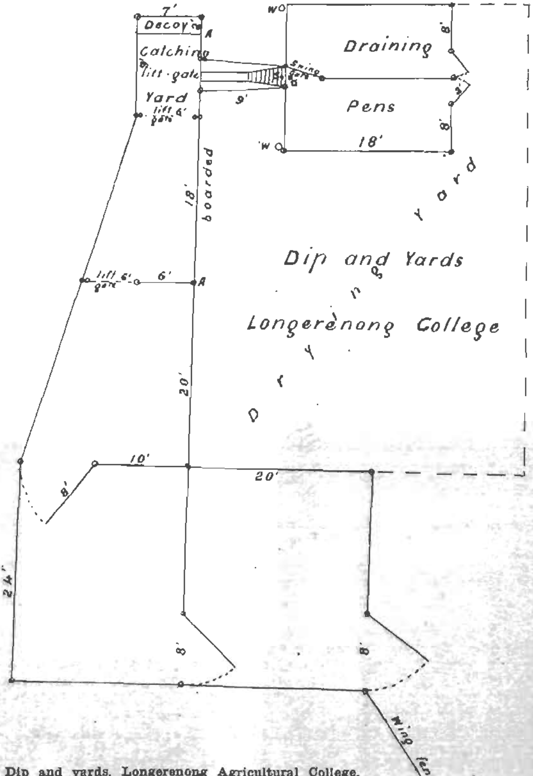


No. 1.—Dipping bath for small flocks.

handling and bruising of sheep, ending in a sudden drop into the dip, and a long climb out at the other end. These are well known to most farmers; and the aim in this plan was to avoid these drawbacks as much as possible.

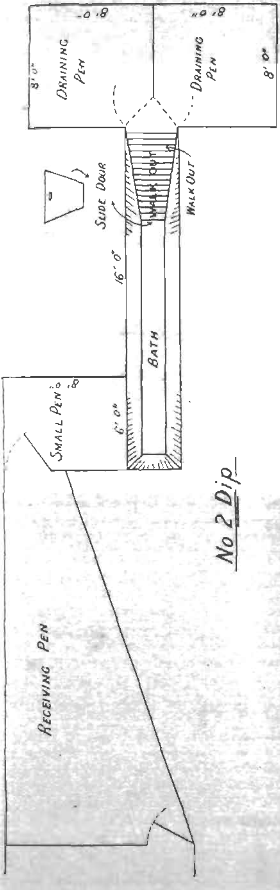
"The galvanized iron dip used cost £7 15s. in Melbourne, and was built there by a local manufacturer. The whole of the work is on one general level. The floor of the draining pens has a fall of 1 inch from the centre to each side, where a drain catches the liquid dripping from the sheep and runs it into two wells (W.W), each drain having a fall of 2 inches from back to front. The liquid is pumped from the wells back into the dip with a Californian pump made by a local plumber. The bottom of the pump is closed and perforated to keep out any dirt. When ordering the bath it would be advisable to stipulate for a curved pipe to be put in at the end near the top at S which should lead to a shallow opening at G, covered with a grating. If the drains are led to this, the liquid draining off the sheep will run back to the bath by gravitation. The pipe should be 3 inches in diameter.

"In the catching yard and draining yards the soil was excavated to a depth of 15 inches. Sand was then put in to a height of 1 foot, and a floor of bricks in cement made on top. The yards cost more with us than



Dip and yards, Longerenong Agricultural College.

they would in a district where good splitting timber is available. All the timber had to be purchased; and, with the exception of the posts, which



No 2 Dip

For small flocks, built for Mr. D. McDonald, Darraweit Guim.

were old railway sleepers, sawn timber was used. The fences are about 3 ft. 6 in. high, boarded with four 6-in. x 1-in. hardwood boards, six boards being used from A to A on plan to prevent the sheep seeing the dip. The posts are about 6 feet apart, and 2 feet in the ground. A hurdle is placed across the front of the decoy pen, so that the sheep in it can be plainly seen by the flock. The draining pens will each hold about 40 crossbred sheep, and the yards and catching pens about 400 to 500 sheep. The price of the timber will vary so considerably with the district, that it is of little use to give the cost of the yards.

"To protect the bath, and to obviate the necessity of removing it each year, we built a wooden framework around the outside, between it and the earth, both the bath and the framework being tarred. A check gate is provided with the bath, to prevent the sheep going through too quickly; but we found that many of them jumped well out and the bar of the gate caught them under the neck, so the check gate was removed. The sheep can easily be kept in the liquid by means of the crutch without injuring them. To prevent splash, a good plan is to put a 6-in. x 1-in. board along each side of the bath on its flat and projecting an inch or two over the bath. This can be fastened down to the sill under the rim of the bath, or to blocks driven into the ground."

No. 2.—This is also for dealing with small flocks, but is of substantial construction, built for Mr. D. McDonald for use on his property at Darraweit Guim.

Dimensions of Bath.—Length at top, 16 feet; length on floor, to foot of ramp or "walk-out," 9 feet; width, inside measurement, 3 ft. 9 in. at top, 1 ft. 3 in. at bottom; depth, 5 feet.

No slide was made, the sheep being put in by hand from a small pen alongside bath.

There is a sliding door at the foot of ramp to keep the sheep in as long as required.

Draining Yards.—Two are provided, each 8 feet x 8 feet, with swing-gate hung on end of dividing fence to enable yards to be used alternately.

Material.—Concrete mixed in proportion of seven parts gravel to one of cement. Walls and floor of bath are 5 inches in thickness, faced by ½ inch of cement mortar, four of sand to one of cement. Floor of ramp is faced with mortar, two to one sand and cement, and is formed in slats or corrugations to give a good foothold. Floor of draining yards is 6 inches in thickness, laid on good sand foundation, and faced with 1 inch cement mortar two in one, and formed with a slope of 3 inches in 8 feet towards dividing fence between yards, and also from back of yards towards bath.

Ten casks of cement and about 9 cubic yards of gravel were used in construction, and total cost was about £20, including labour.

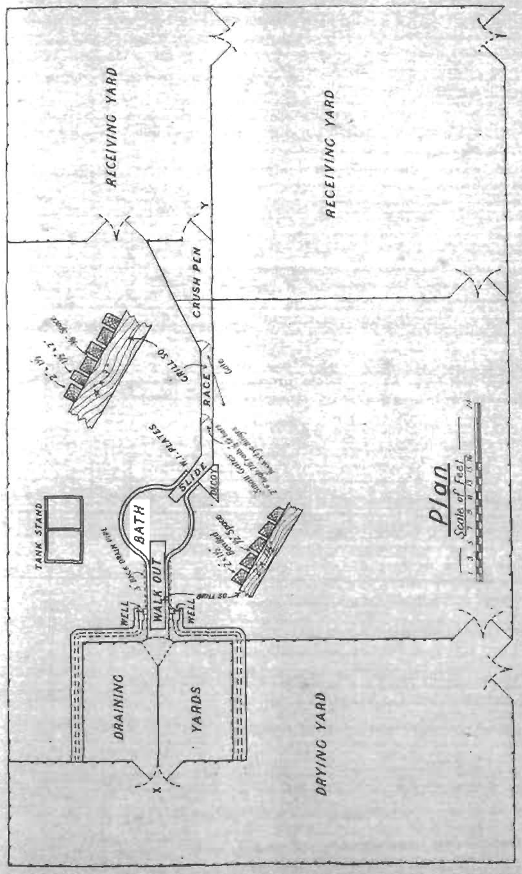
Since this dip was constructed, however, the price of cement has largely increased, and it would probably be better to substitute bricks for concrete, and grout with cement mortar.

No. 3.—Ballarat City Council Dip.—This is a circular bath dip, the sheep passing down a slide from the end of the race leading from receiving yards, fixed at an angle of 45 degrees to the race, with a drop of five in seven. There is a decoy pen at the end of race to hold two or three sheep. I saw some 400 young sheep put through in an hour under the direction of Mr. Cadden, the City Council's officer. They went well, and were thoroughly dipped.

The bath holds eight average-sized sheep at a time, and the last "block" of the race has the same capacity, so that whilst the sheep are soaking the race is refilled, and the loss of time is slight.

When a dip is required for comparatively small lots of sheep, a round bath is, in my opinion, preferred to a short rectangular one. In the former, the sheep may be kept swimming round as long as desired without any check, whereas in the latter they must be checked in order to give them the requisite time to soak, and they are either kept floundering about or turned back; in the latter case they meet sheep swimming in the opposite direction, and a block occurs.

A circular bath such as the one under notice (and one of smaller dimensions might be made if desired) is also comparatively economical to fill, and may, therefore, be bailed and recharged when used for several lots of sheep, thus avoiding the use of foul wash. Its full capacity is 1,160 gallons. It may be used down to the 3-ft. mark for small sheep and lambs. This depth represents about 500 gallons of wash. It will be seen that, when refilled, the liquor is very much freshened, and the necessity of very frequent cleaning out is much reduced, hence cheaper work can be done for small lots.



No. 3.—Ballarat City Council's Dip.

Hereunder is a description and particulars of its construction, kindly supplied by Mr. Farrer, City Engineer, Ballarat:—

Dimensions of Bath.—Inside diameter, at top, 9 feet; inside diameter, at bottom, 4 feet; depth, 5 ft. 3 in., with a 12-ft. long ramp or "walk-out"; slope, one in three.

Draining Yards.—Two, each 16 feet x 10 feet, with slope towards gutter at outer edge, whence the liquid runs into small settling pits, one on each side, fitted with gully-well to catch grit and filth, and grating to strain off floating matter, hence only strained liquid gets back to bath.

The silt and thick liquor so checked is drained away by removing a wooden sluice-gate, which opens the pit to the bottom. When the dip is not in use, this sluice-gate is left out, so that rain water draining off the pens cannot get into the bath.

The constructive material is cement concrete, in proportion of six parts gravel to one of cement for the main part of the work. The inner sides of all walls and bottom are rendered to a thickness of ½ inch with two to one cement mortar, finished off with a coat of ¼ inch thick of one to one cement mortar.

The walls and floor of bath are both 6 inches in thickness.

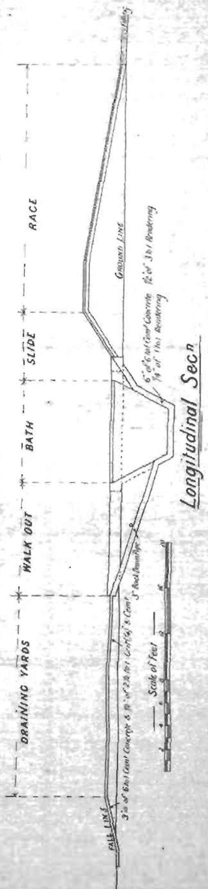
The floor of draining yards is 3 inches thick of six to one, as before, faced by ½ inch of two and a half to one grit and cement, and formed on good sand foundation.

"Slide-in" above bath top is of timber, lined on bottom with plain sheet iron, about ⅜ inch thick.

Hereunder is given the capacity of bath at different marks, as gauged by tank measurements:—

Mark at depth of—	
4 ft. 9 in.	1,160 gallons.
4 ft. 3 in.	949 ,,
4 feet	848 ,,
3 ft. 9 in.	757 ,,
3 ft. 6 in.	664 ,,
3 ft. 3 in.	571 ,,
3 feet	497 ,,

Note.—One hundred and sixty average-sized sheep will remove 100 gallons of



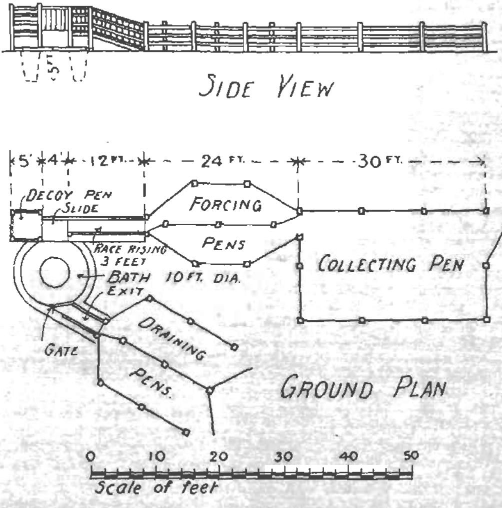
Ballarat City Council's Dip.

fluid from the bath, but a considerable portion of this will be returned if the animals are allowed sufficient time in the draining yards.

Approximate cost of bath and draining floor was £35 (in 1913).

Total cost, inclusive of fencing and gates for receiving, draining yards, and race, paving, two water tanks, and water service from main was about £126.

No. 4.—This is a dip shown on Departmental Farm Buildings Plan No. 7; it is of about same dimensions and style as that of No. 3, with the addition of a central pillar, which results in a saving of wash, and



No. 4.—Dip Circular bath with centre pillar.

is considered an improvement; it should tend to keep the sheep swimming round evenly, and regulate the uniformity of time each sheep remained in the bath.

Specifications regarding material, &c., are similar to those given for No. 3.

No. 5.—This is a dip suitable for large flocks, and is shown on Departmental Farm Buildings Plan No. 8. The bath provides for a swim of upwards of 30 feet, and the draining pens are well planned.

as are also the receiving and forcing yards. The sheep enter the bath by a slide leading straight from the end of race, and no decoy pen is provided for.

Specifications of material, &c., may be worked out from those given relative to No. 6.

No. 6.—Dip constructed by Mr. Wallace, at Drummartin Estate, near Elmore.

Material.—Brick grouted in cement, faced with cement mortar, three of sand to one of cement.

Dimensions.—Bath—length, 40 feet at top; 26 feet at bottom to the foot of ramp or "walk-out"; width, inside, 22 inches at top, 10 inches at bottom; depth, 5 feet at the back, 4 feet at foot of ramp.

Construction.—Walls of bath 4 inches, *i.e.*, one brick in thickness, with a pier or column of three bricks square built in each wall, 13 feet from the back end, to strengthen it; building iron is laid in every fourth course, and a good packing of clay or other solid material rammed in behind to support walls.

The wall at the back, and for 4 feet of side opposite the slide-in, is built 3 feet above the level of the ground. Along the top of the wall, all round, one brick is placed lengthways, at right angles, to form a coping. On the floor of bath the bricks are laid on edge on good sand foundation.

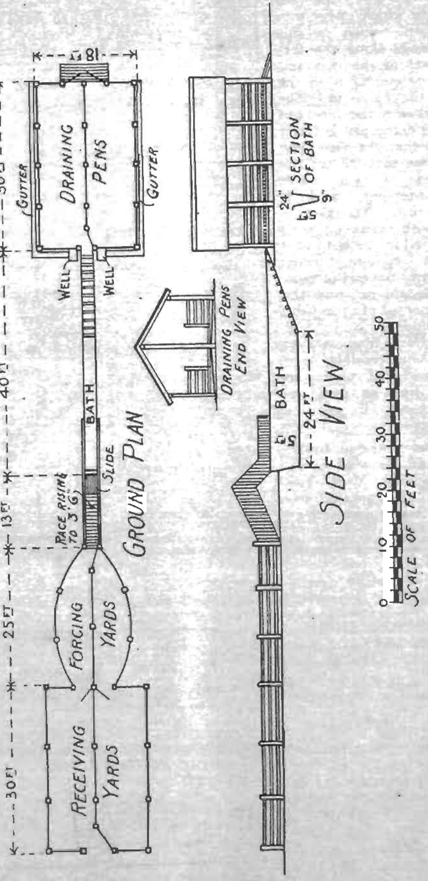
The ramp is faced, or overlaid, with 3 inches of cement mortar (three in one), and formed in slats or corrugations to give the sheep a good foothold in walking out; it is also widened slightly towards the top.

Draining Yards.—Two yards, each 20 feet x 20 feet, floor formed of bricks laid on edge on good sand foundation, grouted and faced with 1 inch of cement mortar, as before mentioned. The floor has a slope of 3 inches in 10 feet from the sides to the centre of each yard, and a slope from the back of the yards towards the bath of 1 inch in 10 feet. The liquid drains into two settling pits 2 feet in depth by 2 feet x 1 ft. 3 in., from which it runs through strainers placed at the entrance to channels near the top of the pits, and thence by pipes or channels under the surface to the bath, which it enters 8 feet from the "walk-out."

These pits can be frequently skimmed of droppings, pieces of wool, &c., and baled out when necessary, thus to an extent preventing the dip from becoming fouled.

A gate is hung on end of fence dividing the two yards, to fasten back to a post at either side of walk-out, and so that the yards may be used alternately.

Entrance to dip is by a race leading from receiving yards, 10 feet long, 1 ft. 3 in. in width, inside measurement, with slide 3 ft. 6 in. on the side of the end abutting bath. The slide, which is placed at an angle of about 45 degrees, is constructed of hardwood, and is kept well greased or wet when the sheep are going through.



No. 5.—Long swim dipping bath.

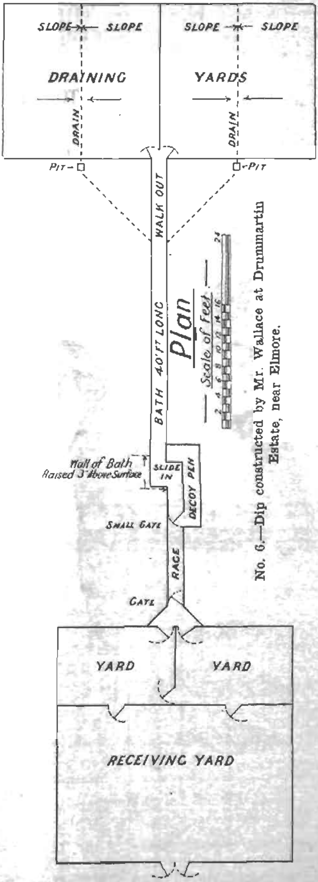
Half way along the race is a gate which opens into decoy pen, which in this dip extends along the forward part of the race and round the end of it to the back of the "slide-in." The fence between the race and this long decoy pen is fairly open, so that the sheep can readily see through it; the outer side of race, where the "yarders-up" work, is boarded up. The race is floored with hardwood, with a slight fall in the last panel to top of "slide-in," which really forms the end of race. Water is laid on, and the arrangements of this dip are complete and convenient, Mr. Wallace having, as far as possible, combined the good points of various dips he had inspected before having his own constructed.

I consider the draining system and style of decoy pen particularly good. The owner kindly supplied me with the following particulars *re* approximate cost, &c., and will, I feel sure, be pleased to give any sheep-owner further details if desired:—

Material used—

Bricks, 5,800 ...	£31*
Cement, eight casks ...	
Posts, rails, &c. ...	
Labour	24*
Cartage	8
Total ...	£63

*Price of cement has increased, and probably cost of labour also, since the above estimate was given.



No. 6.—Dip constructed by Mr. Wallace at Drummartin Estate, near Elmore.

INSECT PESTS OF THE FRUIT, FLOWER, AND VEGETABLE GARDEN.

AND HOW TO TREAT THEM.

By C. French, Jnr., Government Entomologist.

(*Continued from page 317.*)

CASE MOTHS.

There are several species of stick-case insects, which attack vegetables, fruit, and fruit trees, and garden plants. Most of the damage is done by the insects before they are noticed. The perfect insects, in most cases, are small moths, the females being destitute of wings, and are rarely seen outside their stick-houses. The females bring forth their young in myriads; these latter escape in crowds, let themselves down, by a silk thread spun from the lower lip of the case, until they reach a twig or leaf; and then each immediately begins to construct a separate case of tough silk, the outside covered with particles of bark, &c., to protect it during the period of its larval existence. Tree-growers will have noticed little clusters of leaf-like substances, which are constantly on the move. If these be examined carefully, it will be seen that the moving objects are these insects in their early stages; and even when so small, it is surprising the amount of damage they do in a very short space of time. The orange case moth causes considerable damage to orange, lemon, quince trees, and vines. Several species of the "lictor, or faggot case moths," which appear at intervals in immense numbers, are very destructive to cypress hedges near Melbourne. Fortunately, these case moths are easily

Fig. 10.—Case Moths.
(*Metura elongata*, Saunders.)

destroyed by the arsenical sprays, Paris green, or arsenate of lead. The latter spray causes the hedges to look as if they had been whitewashed; but after the insects have been destroyed, which is about a day, the hedges should be hosed, and all traces of the spray will disappear.

The Vine Moth.

This is probably one of the commonest moths found in Victoria; it is recorded from every locality where vines are cultivated, and is one of the vignerons' greatest enemies. The moths deposit their eggs on the vine, and these soon hatch, and the young caterpillars at once commence to feed. The first brood generally appears in October, and after a few weeks enter the pupa state about the beginning of December, the moths emerging about the end of December. It will thus be seen how rapidly these insects increase. The larvæ, when newly-hatched, are of a dark greenish-black colour; but as they increase in size, the colouring becomes greenish-yellow. This moth is a native insect, but, unfortunately, is one that forsakes its native food for something which is no doubt easier eaten and more palatable. When vines, fuchsias, or Virginian creepers are attacked, spray with arsenate of lead. Another moth, the vine hawk moth, probably an introduction from Europe, is also destructive to our vines. Its larva is a formidable-looking creature, sometimes greenish in colour, and sometimes brown, measuring often 3 inches in length.

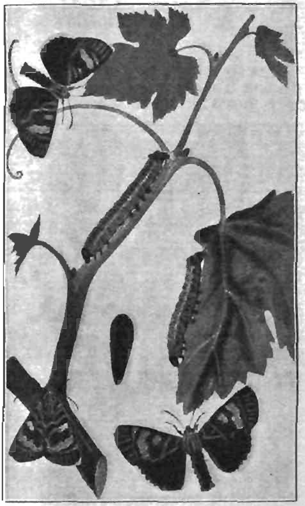


Fig. 11.—The Vine Moth.
(*Agarista glycine*, Lewin.)

Tomato Moth.

One of the worst pests of tomatoes is the tomato moth. It belongs to the cutworm moths (Agrotis, Heliothis, &c.). These caterpillars hide just under the soil in the day time, and at night come up and eat the tomatoes. At other times, the moths deposit their eggs on the tomatoes, and the young, as soon as they emerge, commence to bore into the tomato, and in a very short time the inside is eaten out. The caterpillars are about an inch long, of a dirty, brownish colour. They are usually curled up just under the soil. The female moths hide in the day time under wood, old bags, weeds, &c., and in the evening fly about

from plant to plant depositing their eggs. Poisoned baits can be used, which are made as follows:—Bran, 10 lbs.; molasses, 4 lbs.; Paris green, 4 ozs. The whole is to be made into a paste or dough, and placed, in small pieces about the size of a nut, amongst the tomato plants; this will destroy cutworms wholesale. The tomatoes themselves should be sprayed with arsenate of lead, but should be washed before using.

CUTWORMS.

These moths, which are found in countless thousands in all parts of Victoria, are known as "Bogong," and "Take-all" moths. The caterpillars not only destroy wheat and other grain crops, but attack vegetable and garden plants, especially carnations, dahlias, and rose buds. One species, *Agrotis munda*, "the Bogong moth," was regarded as a great delicacy by the Aborigines, and annual trips to the Bogong and other ranges were taken, where the moths could be obtained in thousands. The Bogong moths crowd on the surfaces, and also in the crevices of granite rocks in incredible quantities; to procure them with greater facility, the natives used to make smothered fires underneath these rocks, and about them the moths collected, and were suffocated with the smoke. After they had collected a large quantity, the blacks proceeded to prepare them. According to various authorities, the following procedure was observed:—A circular place was cleared upon the ground, of a size proportional to the number of insects to be prepared; on it a fire was lighted and kept burning until the ground was considered to be sufficiently heated, when the fire was removed, and the ashes cleared away. The moths were placed upon the heated ground, and stirred about until the down and wings were removed. They were then placed upon pieces of bark, and winnowed to separate the dust and wings from the bodies; they were then eaten, or placed in a wooden vessel called a "Culiban," and pounded by a piece of wood into masses or cakes resembling lumps of fat. These were smoked, and kept good for a fairly long period. The first time this diet is partaken of by

Fig. 12.—The Tomato Moth.
(*Heliothris armigera*, Hubn.)

the native tribes, violent sickness is caused; but, after becoming accustomed to it—generally in a few days—they thrive and fatten in a remarkable manner upon it. The quantities of moths that may be collected from one of the granite groups, it is calculated, would amount to at least 5 or 6 bushels. These moths appear in countless millions near Melbourne, at irregular intervals, in the summer evenings after a hot day. When a hot north wind is blowing, they are carried out to sea, and when the tide comes in they can be seen strewn for miles along the beaches at Sandringham, Mordialloc, Frankston, and other parts along the Bay; in fact, they can be shovelled up in places. The remedies recommended for tomato moths will rid gardens of these pests.

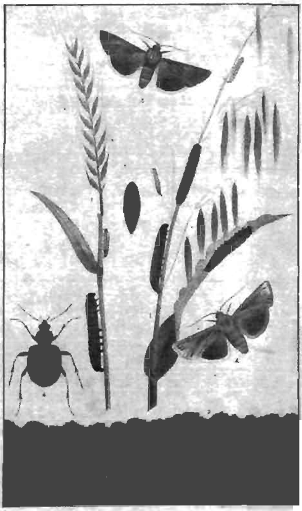


Fig. 13.—Cutworm Moths.
(*Mamestra Ewingi*, and *Agrotis sp.*)

PAINTED APPLE MOTH.

The inroads that many moths, whose natural food plants grow in our bush, are making into the orchards and gardens of Victoria and New South Wales is a subject well worthy of investigation.

The caterpillars of this handsome little moth are very destructive. In its native state, it feeds upon the foliage of a number of different species of wattles, but it is now almost omnivorous in its habits. It has been particularly plentiful recently, and has attacked apples, quinces, plums, also pelargoniums, stocks, bouvardias, and other garden plants. When fully grown, the caterpillars measure about 1 inch in length. They are clothed in long hairs, with two curious appendages projecting from near the tail.

When fully grown, they crawl into any corner, and spin a loose light-brown, silken cocoon, through which the pupæ can be seen. The male moth measures about an inch across its outspread wings, of which the fore pair are dark-brown, marbled with yellow and grey markings.

The female is much larger, and is wingless; its life is very short for it crawls out of the cocoon, lays its eggs upon the top of it, and dies.

Fig. 14.—The Painted Apple Moths. (*Teia anartoides*, Walk.)

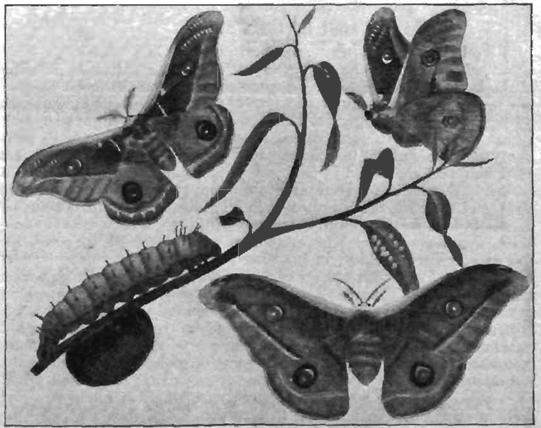


Fig. 15.—Gum Emperor Moth. (*Antherea eucalypti*, Scott.)

Prevention and Remedies.

Hessian bands, similar to those used for codlin moth, have been tried with great success. Spraying the trees with any of the arsenical sprays will also be found of much advantage.

Gum Emperor Moth.

This is one of the finest Victorian moths, and has a wide range over the other States. Its large, beautiful green caterpillars are often to be seen on pepper and eucalyptus trees in our gardens. The eggs, which are like little white or creamy beads, are generally placed on the edges of the leaves, sometimes the edges being lined with them. When hatched, the caterpillars are very dark, almost black-coloured, but by successive moults soon change to the beautiful green tint of the full-grown caterpillars, which has star-like tufts on each segment. The caterpillars often measure 5 inches in length. The cocoons are oval in shape, and measure 1 inch to 1½ inch in length, and are very tough. The moths are of a delicate reddish-fawn colour, but variable in both size and colour, often with a pink tint and four eye-like spots or blotches—two on the upper wings and two on the lower wings. Recently, these caterpillars have attacked apple trees and roses. Spray with any of the arsenical sprays. These insects are often destroyed by ichneumons and other hymenopterous insects, wasps, &c., also by parasitic flies.

(*To be continued.*)

COST OF INSECT PESTS.

"We hardly realize," says an American magazine, "that £50,000,000 a year, about £1,000,000 a week, is spent directly or indirectly in trying to check the ravages of the insect pests that prey on the crops. Besides this the pests eat, according to Government estimates, about £160,000,000 worth of food annually, which brings their cost up to over £200,000,000 a year clear loss. In every State effective war is waged on those pests. Every weapon known to science is employed. But no sooner is a particular pest conquered in one part of the country than it appears in another. Emphasis has been placed in recent years on insect-destroying birds, and these are being protected in all kinds of ways. Laws against the use of bird feathers on hats are part of this protection, and in many States forest areas have been established as bird refuges. Science has also attacked the problem in breeding insects to destroy other insects. The melon aphis, for example, used to cost the growers in one Californian valley £1,000,000 a year. The lady bug, it was found, devoured the aphis. So lady bugs were collected and kept in cold storage. About 2,000 lbs. were gathered in certain canyons in the Sierras, each pound representing about 25,000 bugs. They bred prodigiously. It was found that 50,000 of them would keep 20 acres of melons free of the aphis and other plant lice. As a result, bumper crops have since been raised. So now scientists are studying the problem of bugs to eat bugs, which shall in themselves be harmless to the crop. And thus the battle for the crop goes on yearly, and never before, perhaps, with such success or with such general application."

VICTORIAN RAINFALL.

First Quarter, Year 1916.

District.	—	January.	February.	March.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean.. ..	49	1	5	55
	Normal	55	68	116	239
	Per cent. above normal	..	..	..	..
	„ below „	11	99	96	77
Mallee South	District Mean.. ..	146	19	10	175
	Normal	57	78	100	235
	Per cent. above normal	156	..	..	..
	„ below „	..	76	90	26
North Wimmera ..	District Mean.. ..	100	32	2	134
	Normal	64	70	98	232
	Per cent. above normal	56	..	..	..
	„ below „	..	54	98	42
South Wimmera ..	District Mean.. ..	105	27	1	133
	Normal	93	78	112	283
	Per cent. above normal	13	..	..	..
	„ below „	..	65	99	53
Lower Northern Country	District Mean.. ..	168	62	9	239
	Normal	90	79	118	287
	Per cent. above normal	87	..	..	..
	„ below „	..	22	92	17
Upper Northern Country	District Mean.. ..	163	95	10	268
	Normal	116	96	138	350
	Per cent. above normal	41	..	..	..
	„ below „	..	1	93	23
Lower North-East ..	District Mean.. ..	192	125	74	391
	Normal	154	147	231	532
	Per cent. above normal	25	..	..	..
	„ below „	..	15	68	27
Upper North-East ..	District Mean.. ..	336	235	76	647
	Normal	217	182	284	683
	Per cent. above normal	55	29	..	..
	„ below „	..	..	73	5
East Gippsland ..	District Mean.. ..	291	415	221	927
	Normal	256	217	241	714
	Per cent. above normal	14	91	..	30
	„ below „	..	..	8	..
West Gippsland ..	District Mean.. ..	419	348	124	891
	Normal	229	159	280	668
	Per cent. above normal	83	119	..	33
	„ below „	..	..	56	..

VICTORIAN RAINFALL—*continued.*

District.	—	January.	February.	March.	Quarter.
		Points.	Points.	Points.	Points.
East Central	District Mean.. ..	381	182	67	630
	Normal	233	173	282	688
	Per cent. above normal	64	5	..	..
	" below "	..	..	76	8
West Central	District Mean.. ..	214	172	28	414
	Normal	146	131	211	488
	Per cent. above normal	47	31	..	..
	" below "	..	..	87	15
North Central ..	District Mean.. ..	214	118	11	343
	Normal	130	122	180	432
	Per cent. above normal	65	..	..	..
	" below "	..	3	94	21
Volcanic Plains ..	District Mean ..	217	62	9	288
	Normal	139	117	184	440
	Per cent. above normal	56	..	..	..
	" below "	..	47	95	35
West Coast	District Mean.. ..	254	87	24	365
	Normal	148	126	209	483
	Per cent. above normal	72	..	..	..
	" below "	..	31	89	24

N.B.—100 points = 1 inch.

Dry conditions prevailed generally during the first three weeks of January, but the latter end of the month witnessed some very heavy falls, rains of a widespread character falling throughout the State. In the Mallee these rains hindered the harvesting operations, but in the Central, South, and Western Districts their effect was decidedly advantageous with regard to the potatoes, summer fodders, and orchards. With few exceptions, the harvesting results equalled or exceeded anticipations, and in the neighbourhood of Lismore, in the west, the average yields were estimated at 25 bushels per acre; and in parts of the Wimmera, 42 bushels were obtained. All the available stock were in exceedingly good condition owing to the abundance of food, but the general regret of the farmer was that he had insufficient stock to eat down the prolific herbage. In Gippsland the early rains were exceedingly beneficial, and arrived most opportunely, and in time to resurrect the late-sown maize, and also the potato crop.

Very little rain occurred in the Mallee and Wimmera during February, but in the North-East and Gippsland, some heavy falls were experienced, due mostly to monsoonal conditions; and some very heavy thunderstorms, especially in Central and North-East, took place. These rains had a beneficial effect on the maize and potato crops, promoting vigorous growth, and insuring more than a sufficiency

of green grass; but, as stock was exceptionally dear, and the price fabulous—as much as £20 being demanded for milch cows—the replenishing of the herds and flocks could not be undertaken, except by the financially strong class.

March was a dry month, at some places north of the Divide an entire absence of rain was noticeable. In fact, East Gippslanders were the only ones to benefit during the period; the rains in this part o. the State either exceeded or approximated to average conditions. They were the results of thunderstorms, and were highly appreciated, as stock maintained their previous high standard of excellence in condition, and the potato, maize, and other summer crops showed splendid results, and dairying operations were ideal. In the Mallee, the absence of rain in any appreciable quantity during this month, and its predecessor, had a bad effect on the pastures; and in the Wimmera, stock were generally falling off in condition, and water was becoming scarce. Elsewhere, stock were fat, but inland rivers had ceased to flow and the supply of water was diminishing—Gippsland being the exception. Record yields of fruit of exceptionally good quality were being obtained everywhere.

H. A. Hunt,
Commonwealth Meteorologist.

29.4.16.

WALL PAPERS THAT DESTROY LIGHT.

People are constantly asking what is the best colour for wall paper or hangings. The following table will give the fullest particulars. Common wall papers were tested recently in an illuminating laboratory for their light-absorbing qualities, with the following results:—

Wall papers.	Percentage of light absorbed.
White	30
Chrome yellow	38
Orange	50
Plain deal	55
Yellow	60
Light pink	64
Emerald green	82
Dark brown	87
Vermilion	88
Blue-green	88
Cobalt-blue	88
Deep chocolate	96

This table shows that if a room papered with dark green be re-papered with chrome yellow, it will be four times as light with the same lamps and windows. In many cases householders pay too much for electricity and gas lighting because their light-absorbing wall coverings destroy the light rays.

BUILDING UP A FLOCK.

Thirteen years ago, when Mr. J. Anderson, of Knysvale, Victoria, was a child, an uncle gave him a Shropshire ewe as a birthday present, and later on lent a Shropshire ram. In due course twin lambs were born. Later on, the original ewe and two ewe lambs dropped more lambs, the boy being indebted again to his uncle for the loan of a ram. A proportionate increase was recorded with each succeeding year, and the youthful stockbreeder had retained a few of his ram lambs. His father then gave him the free use of a paddock of 300 acres. Mr. Anderson remarked to the writer:—"I wanted my boy to stay on the farm, and since he displayed an intelligent interest in his little flock I reckoned that if he could make money out of sheep he would soon realize that he had something better than a billet in the city." He has got something better than "a billet." He made a practice of selling a majority of the ram lambs and breeding from the ewe lambs. To-day his flock of 67 Shropshires is the result of his own breeding. With money originally realized through the sale of Shropshire ram lambs, he purchased crossbreds, since he had the freedom of ample grazing area. Further sales brought in more money, with which he purchased additional sheep. In April last, when his flock comprised about 135 ewes and 7 rams all told, he purchased 55 crossbred ewes. This purchase was made with money banked from sale returns of the character noted. His deal of the past year returned him 7s. per head for wool shorn from sheep that cost him 13s. each last April. The ewes are his property still, and, in addition, he has a complement of lambs. What this extra asset means to-day it is hardly necessary to specify, but given a fair percentage of ewe lambs, this most interesting flock shows every promise of increasing well up to the 500 total before the end of the present year.—*Auckland Weekly News*, 24th February, 1916.

STOCKHOLM TAR.

Now that the season for pruning fruit trees and lopping forest and ornamental trees is approaching, it is an appropriate time to bring under notice the virtues of Stockholm tar as an antiseptic and germ destroyer.

Where a branch is sawn or cut off and the bark trimmed round with a knife, then the tar should be at once applied with a brush or piece of stick. If genuine Stockholm tar, it will be very thick and viscous in cold weather, and should be warmed before application. The whole of the surface of the wound should be covered. This is Listerism applied to vegetation, as the tar prevents unfavorable germs from developing and promotes a healthy growth. In a short time new wood completely covers the wound even when the branch is 6 inches or more through, and a perfect cicatrix results.

Coal tar must *not* be used, as it is destructive and objectionable.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917.

Commenced 15th April, 1916; concluding 14th April, 1917.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.5.16	15.5.16 to 14.6.16	Total to Date.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
17	W. G. Swift	White Leghorns	120	135	255	1
27	John Blacker	"	116	134	250	2
40	*A. Brundrett*	"	*115*	132	247	3
7	C. J. Jackson	"	108	137	245	4
13	H. J. Meddows	"	122	118	240	} 5
36	E. W. Hippe	"	113	127	240	
41	*Excelsior Poultry Farm*	"	*108*	129	237	} 7
25	A. H. Mould	"	104	133	237	
11	R. W. Pope	"	121	112	233	9
38	V. Little	"	115	117	232	10
16	F. Collings	"	115	115	230	11
1	G. McDonnell	"	111	118	229	12
37	J. M. Smith	"	103	116	219	13
3	W. M. Bayles	"	110	103	213	14
28	S. Cheatle	R.C.B. Leghorns	83	129	212	15
34	F. G. Silbereisen	White Leghorns	105	105	210	16
26	Mrs. A. Dumas	"	104	101	205	} 17
24	*H. N. H. Mirams*	" (5 birds)	79	*126*	205	
15	G. Laughlan	White Leghorns	113	91	204	} 19
44	J. Jamieson	"	71	133	204	
30	F. T. Denner	"	79	125	204	
23	T. A. Pettigrove	"	93	109	202	22
22	Mrs. H. Stevenson	"	83	115	198	23
12	G. Hayman	"	109	87	196	24
10	J. H. Duncan	"	44	143	187	25
18	C. Ludwig	"	103	80	183	26
14	W. B. Hustler	"	65	113	178	27
45	C. H. Oliver	"	83	93	176	28
32	N. Burston	"	44	124	168	29
5	W. G. Osburne	"	101	61	162	} 30
20	H. Merrick	"	93	69	162	
6	J. J. West	"	101	57	158	32
21	A. E. Payne	"	74	79	153	33
42	Thirkell and Smith	"	68	76	144	} 34
19	Benwerren Egg Farm	"	65	79	144	
29	A. S. Hyndman	"	50	93	143	36
39	L. McLean	"	12	124	136	37
43	S. Buscumb	"	70	50	120	38
8	E. A. Lawson	"	52	66	118	39
101	A. E. Silbereisen	"	15	91	106	40
33	E. F. Evans	"	54	37	91	41
9	W. H. Clingin	"	59	12	71	42
35	Tom Fisher	"	5	64	69	43
31	J. H. Gill	"	32	26	58	44
4	Fulham Park	"	5	31	36	45
		Total	3,695	4,415	8,110	
		HEAVY BREEDS.				
		DRY MASH.				
98	Marville Poultry Farm	Black Orpingtons	78	157	235	1
97	D. Fisher	"	95	128	223	2
100	*Oaklands Poultry Farm*	"	68	132	200	3
94	Mrs. Coad	"	30	130	160	4
95	T. W. Pearce	"	70	61	131	5
99	J. Ogden	"	3	39	42	6
96	H. Hunt	"	..	18	18	7
		Total	344	665	1,009	

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917—*continued.*

LIGHT BREEDS.

DRY MASH.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.5.16.	15.5.16 to 14.6.16	Total to Date.	Position in Competition.
46	W. H. Robbins	White Leghorns	140	134	274	1
59	T. A. Pettigrove	,,	134	139	273	2
61	C. C. Dunn	,,	128	130	258	3
52	W. J. Thom	,,	128	127	255	4
54	Mrs. Hughes	,,	108	141	249	5
53	W. N. O'Mullane	,,	115	129	244	6
58	C. Ludwig	,,	105	137	242	7
65	Izard and Tierney	,,	119	122	241	8
56	Mrs. Nicoll	,,	104	136	240	9
62	J. W. Morrow	,,	103	126	229	10
70	G. Wilkinson	,,	113	112	225	11
64	A. Bennett	,,	110	83	193	12
48	Thirkell and Smith	,,	95	97	192	13
55	Rev. J. Mayo	,,	119	62	181	14
47	H. McKenzie and Son	,,	83	93	176	15
60	A. Greenhalgh	,,	77	98	175	16
49	C. Lane	,,	81	85	166	17
69	E. A. Lawson	,,	91	61	152	18
57	H. J. Brown	,, (5 birds)	46	105	151	19
67	Lysbeth Poultry Farm	,,	60	87	147	20
51	Reliable Poultry Farm	,,	80	60	140	21
50	Clevedon Poultry Farm	,,	57	69	126	22
66	Benwerren Egg Farm	,,	15	49	64	23
68	W. G. Osburne	,,	20	43	63	24
63	N. Burston	,,	..	56	56	25
		Total	2,231	2,481	4,712	

HEAVY BREEDS.

WET MASH.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.5.16.	15.5.16 to 14.6.16	Total to Date.	Position in Competition.
74	Oaklands Poultry Farm	Black Orpingtons	140	154	294	1
89	Brooklyn Poultry Farm	,,	136	150	286	2
72	Marville Poultry Farm	,,	141	119	260	3
87	S. Buscumb	,,	119	119	238	4
86	C. Ludwig	,,	118	117	235	5
80	Mrs. Pearce	,,	104	109	213	6
79	Stranks Bros.	White Orpingtons	90	116	206	7
85	Mrs. M. Coad	Black Orpingtons	91	109	200	8
88	A. D. McLean	,,	60	138	198	9
83	L. McLean	,,	69	128	197	10
92	J. H. Wright	,,	60	135	195	} 11
93	L. W. Parker	,,	49	146	195	}
81	K. Courtenay	Faverolles	87	98	185	13
77	Mrs. G. R. Bald	White Plymouth Rocks	56	91	147	14
90	Excelsior Poultry Farm	Black Orpingtons	40	92	132	15
78	Reliable Poultry Farm	,,	33	98	131	16
91	N. Papayanui	,,	36	70	106	17
73	E. W. Hippe	Rhode Island Reds	40	64	104	18
84	H. L. Trevana	,,	30	49	79	19
76	L. A. Errey	Silver Wyandottes	18	33	51	20
75	Mrs. Drake	Rhode Island Reds	32	18	50	21
71	C. E. Graham	Black Orpingtons	..	40	40	22
82	J. Ogden	,,	3	1	4	23
		Total	1,552	2,194	3,746	

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

BURNLEY REPORT.

A week of heavy frosts was a feature of the weather this month. Temperature as low as 23 F. was registered 2 feet above ground, and 28 F. in houses.

Frozen water pipes were the chief trouble experienced. Notwithstanding adverse conditions the birds have done really well, the dry mash light breeds and heavy breeds wet section especially so. The number of partial moulters is not so large as last year, and broodies are also less. Temperature—lowest, 28 F.; highest, 66 F. Rainfall, 208 points.

A. HART,
Chief Poultry Expert.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal School of Horticulture, Burnley.

The Orchard.

PRUNING.

Pruning operations will now be in full swing. In pruning the young trees, heavy pruning will be required in order to produce strong growths and a good frame, but as the tree advances in age the pruning will be reduced considerably. It should be remembered that strong, heavy pruning results in wood growth, and that weak pruning steadies the tree, and promotes an even growth. When framing and building a tree, the former consideration is observed, and when the tree is coming into fruit bearing or is mature, it will be pruned according to the latter. Any operation that will cause the tree to produce less wood growth will induce the tree to become more fruitful, provided the tree be in a healthy condition; so that when trees are mature, pruning operations, as a rule, should not be severe, but rather the reverse.

Old fruiting wood, and dead and dying wood should always be removed, and aged spurs should be considerably reduced, in order to make them produce new growths. Crowded and overlapping laterals should be shortened back; fruit-bearing in the higher portions of the tree should not be encouraged; and due consideration should be given to the admission of light and air to all parts of the tree.

Where varieties of fruit trees are prone to bearing crops every second year, their lateral system should be pruned so that they will not produce too heavy a crop in the fruiting year; and at the same time they will produce wood in their fruiting year to give a crop in the subsequent season.

A model tree will always be light on its topmost leaders, bearing the major portions of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

Drainage.

The rains of winter will always show the necessity for draining orchards. Where under-soil drains do not exist, the trees are bound to suffer. If the damage is not immediately apparent, it will be later found that in some way loss will accrue. Either the tree will be weakened by the loss of roots through rotting, or it will be devitalized so that it will not carry a satisfactory crop of fruit. Too often surface drainage is relied on to remove the so-called surplus water. There should be no surplus water for surface drains. The water is only surplus or excess when it is in the soil. Two circumstances, and two only, permit of surface drainage. First, when it is necessary to carry away excessive stormwater; and, second, when it is practically impossible to find an outlet for under-drains, owing to the low-lying situation of the area.

The term "surface drainage" does not apply to open drains, which, owing to their depth, act also as soil drains; neither does it apply to graded surfaces which allow a more equitable distribution of water. Surface draining is usually applied to a system, whereby a considerable quantity of water is removed by gravitation before it enters the soil. Such a system cannot be too roundly condemned. As much water as can be obtained by natural means should be induced to enter orchard soils; and then whatever is in excess will be carried away by under drainage, provided that drainage, either natural or artificial, be in existence.

Where suitable drainage is not provided, the tree roots are compelled to remain in a few inches of surface soil. Their feeding area is thus extremely limited indeed; and when, at any time, rain-water does filter and penetrate through the soil, it carries with it the soluble and other plant foods, below the reach of the tree roots.

Soil ventilation is only possible with a system of drainage, and air is as necessary to the roots of a tree as it is to the foliage. By the removal of the surplus water and the consequent admission of air into the soil, the soil temperature is rendered far more equable, warmer in winter and spring, and cooler in summer; and such a change must be beneficial to the trees.

Drainage is thus an essential for all orchard lands. When natural drainage occurs, the orchardist is fortunate; but whether natural or artificial, a system of drainage will always materially increase the crop of fruit, strengthen the trees, and considerably add to their term of life.

Drainage schemes should be carried out at the present season of the year. In closed drains, such drainage media as cinders, charcoal, stones, brushwood, timber, logs, or tile pipes may be used, but the latter generally give more satisfactory and permanent results. They are also less liable to silting up than any other materials.

Drains should be placed into the clay, if this be not too deep. In any case, they should be below any possible interference from cultivaing instruments.

Spraying.

In order to keep in check such pests as Bryobia, scale insects, woolly aphis, and others, a strong and forcible spraying with lime sulphur spray should not be delayed any longer. The whole tree should be thoroughly wetted with the spray. A good, vigorous, and thorough winter spraying with lime sulphur will place a large majority of the trees in quite a satisfactory condition of freedom from these pests for the whole year.

The lime sulphur spray, too, is an excellent fungicide, and a strong winter spray will go a very long way in reducing any attack of the black spot fungus on either the apple or the pear. In addition, if the peach trees are sprayed at this time with lime sulphur, both peach aphis and peach leaf curl will be considerably minimised in the spring time.

Flower Garden.

Digging in the garden should be continued. Before digging, the beds should be given a top dressing of lime or stable manure, and subsequently these should be dug well into the soil. Care must be taken not to injure the roots of any shrubs, trees, or roses. Root cutting and root pruning will always dwarf any plant. In digging, it is not wise to discard any leaves, twiggy growths, or weeds. Unless they are required for the compost heap they should always be dug into the soil. Leaf-mould is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Liliums, &c., are grown, or for pot-plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects.

All shrubs that produce flowers on their young growths, including roses, should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood and those that flower on the wood of the past season's growth. Those that flower on the new wood, and may now be pruned, are Lasiandra, Lantana, Cestrum, Tecoma, Hydrangea, Plumbago, Erythrina (some species), &c., and those that should not be touched at present time are Spirea, Erythrina (some species), Pyrus Japonica, Weigelia, Prunus pissardi, P. Vesuvius, P. mume, Deutzia, Polygala, Ceanothus, &c. It is a safe rule in pruning shrubs to wait until they have flowered before pruning. This will certainly give the shrubs a somewhat ragged appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants, such as Salvia, Aster, Delphinium, Polygonum, Boltonia, Gaura, and Chrysanthemum, should be cut back, and, if necessary, lifted and "heeled in" in a temporary location for the winter. Plant out Gladioli, Iris, and Liliums.

Continue digging, manuring, and trenching.

Vegetable Garden.

Seedlings from boxes or seed plots may now be planted out. Care should be taken that all vegetable beds are well raised and thrown up. By throwing up the soil, and thus deepening the paths and the spaces between the plots, the latter are well drained, and the soil is made considerably warmer. This will greatly facilitate the growth of the young plants.

Asparagus may be planted: sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes, the latter being forced on in a frame, so as to obtain good plants quickly.

REMINDERS FOR AUGUST.

Live Stock.

Horses.—Those stabled can be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley.

Cattle.—Cows, if not housed, should be rugged. Rugs should be removed in the day-time when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Calves should be kept in warm, dry shed. Those on the bucket should be given their milk warm. Look out for milk fever and treat as recommended in *Year Book of Agriculture*, 1905.

Pigs.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry, and the feeding troughs clean and wholesome. Store pigs should be placed in fattening styes. Sows in fine weather should be given a grass run.

Sheep.—Decide on the breed and number of rams required for the coming season. Place orders as soon as possible, for breeders can then give better satisfaction and allot preference to the earlier applications. The result of mating should be given most careful consideration from a wool point of view. Evidence points to an extreme shortage of good merino and fine cross-bred wool for years to come. At the same time, a steadily increasing demand has set in for materials manufactured from these finer grades. The world's civilian requirements must be met, and for flannels and finer materials for temperate and cold climates these are indispensable. After all coarse wools have a limited use. Cull stud ewes carefully, especially merinoes, consider form as well as evenness of covering and style of wool. Discard for thin fribby forearms, for coarse common thighs, for mushy wasty undercovering, inferior patches across the shoulders, common and short between the hip bones. Individual merit must be considered carefully, pedigree alone is not sufficient.

Poultry.—Yards should be turned over with a spade or fork, and sown down with rape or barley. Keep the breeders busy—straw litter with a little grain scattered about will make them exercise. Overhaul incubators; see that the capsule of thermostat acts properly; thoroughly clean lamps, egg drawers, and chimneys. Test machine for two days before putting eggs in. It is also advisable to have thermometer tested. When additional incubators are required, it is more satisfactory to keep to the one make.

Cultivation.

Farm.—Second fallow where necessary for summer crops. If required, roll or harrow crops. Plant very early potatoes in forward districts. Sow mangolds. Apply slow-acting fertilizers, such as blood and bone manures, for maize.

Orchard.—Complete planting and pruning of deciduous trees. Watch for peach aphis, and spray with tobacco solution, if present. Prepare for planting citrus trees. Spray for woolly aphis with lime sulphur spray.

Flower Garden.—Finish digging and pruning of roses, &c. Leave pruning of shrubs till after flowering. Keep weeds in check; weed out seed beds. Divide and plant out all herbaceous plants, such as phlox, delphiniums, rudbeckia, &c. Plant out gladioli. Complete planting of shrubs. Mulch young plants.

Vegetable Garden.—Top-dress asparagus beds; plant new asparagus plots. Plant herb divisions, and potatoes. Sow cabbage, cauliflower, peas, carrots, beans, radish, and lettuce seeds. Sow tomato seeds in a hot frame. Finish digging.

Vineyard.—August is the best month for planting vines (grafted or ungrafted). This should be actively proceeded with and completed before end of month. Scions for field grafting may still be preserved as detailed last month, or better still by placing them in cool storage. They should all be removed from vines before end of month, at latest. Conclude pruning and tie down rods. Where black spot has been prevalent, apply 1st acid iron sulphate treatment (see *Journal for July*, 1911).

Cellar.—Rack again, towards end of month, wines which have as yet only been once racked (spring racking). Fill up regularly all unfortified wines. Clean up generally in cellar and whitewash walls, woodwork, &c.

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LUCERNE MANURIAL TESTS.

STATE RESEARCH FARM, WERRIBEE.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

Lucerne is one of the staple crops of the irrigation areas, and its cultivation is rapidly extending. In 1914-15, there were 71,217 acres of lucerne in the irrigation settlements of the State, as compared with 55,535 acres in 1913-14. Its cultivation is spreading through Gippsland, where the ample rainfall enables heavy crops to be grown without irrigation.

Water Requirements of Lucerne.

Where soil and climatic conditions are favorable to its growth, lucerne is one of the most profitable of forage crops. It requires, however, considerable quantities of water to produce heavy cuts of hay, and, given a well-drained soil and a warm climate, the yield of hay is, within certain limits, approximately proportional to the rainfall, or to the amount of irrigation water applied. In carefully controlled tests at Rutherglen and Werribee, to determine the Water Requirements of the crop, it has been found that at least 7 inches of rain or irrigation water were required to produce a ton of lucerne hay per acre. Allowing for the inevitable loss of water from the soil by evaporation, it would hardly be possible to grow a ton of lucerne hay under Victorian conditions on much less than 9-10 inches of rain or irrigation water. To secure annually a yield of 5 tons per acre, lucerne must have an *amount of water equivalent to 45 inches of rain*. If the rainfall, say, is 20 inches per annum, then, to secure a yield of 5 tons per annum, the rainfall must be supplemented by another 25 inches of irrigation water. It will be seen, therefore, that, apart from the quality of the soil, heavy yields of lucerne are only to be expected—

(1) In districts of abundant rainfall, or
(2) Where subterranean water is within easy reach of the lucerne roots.
(3) Where irrigation is practised.

8922

Soil Requirements of Lucerne.

So far as the soil conditions are concerned rich river flats resting on a well-drained, porous subsoil present almost ideal conditions for lucerne.

The soils of the Nemingha Valley, in New South Wales, and at Bacchus Marsh, Victoria, and the reclaimed swamps along the Murray River (S.A.) are of this character, and it is on these soils that we see lucerne at its best.

In these subsoils the lucerne can develop its wonderful root system, carry on its unequalled power of nitrogen fixation, and draw the necessary water supplies for the vigorous overhead development of the plant.

In the Nemingha Valley irrigation is unnecessary, as the district enjoys a good rainfall and the roots are within easy reach of subterranean water. On the reclaimed swamps of the Murray River and at Bacchus March lucerne may be seen at its best under irrigation.

Fig. 1.—View Showing Method of Harvesting Lucerne, State Research Farm, Werribee.

The high rentals paid for lucerne lands in these areas are a striking testimony of the wealth-producing power of the lucerne plant. Unfortunately the areas of such superlatively rich soil are limited, and the great bulk of the soil and subsoil on which lucerne is grown has neither the favorable mechanical condition nor the chemical composition of these naturally rich soils. Much of the lucerne in the irrigation areas has been sown on old wheat lands. These consist mostly of clay loams resting on a more or less stiff clay subsoil. These soils are well suited for wheat-growing, but the subsoils are generally too stiff to permit the perfect development of the root system of the lucerne, and the overhead growth—and consequently the yield of produce per acre—is considerably less than that of the more favoured districts. On many of the settlements, particularly Cohuna, and Bamawm, and Shepparton, loamy soils resting on porus subsoils are often met with, and on these

the growth of lucerne leaves little to be desired, and the yields from such soils under irrigation compare favorably with the best lucerne lands in Australia.

The Werribee Soils.

The soil at present under lucerne at the State Research Farm, Werribee, is similar in character to much of the land in the Goulburn Valley. It consists of reddish clay loam 7 inches to 10 inches deep, resting on a stiff, red clay subsoil. It takes water slowly and sets hard after irrigation. It is naturally deficient in organic matter, and continuous cropping with cereals for twenty-six years prior to the laying down of the lucerne tests had considerably depleted the already limited reserves of this all-important soil ingredient. The land, therefore, was in a similar condition to much of the soil in the northern irrigation areas, where wheat-growing had been carried on for at least a generation prior to sowing down with lucerne.

The results obtained at Werribee justify the view that even on these worn-out lands heavy and profitable crops of lucerne can be grown. In October, 1912, a block of 15 acres was subsoiled 12 inches deep, graded, and sown with Tamworth lucerne. In the following season six cuts were obtained from this area, and the block averaged 6½ tons of commercial hay (85 per cent. of dry matter) over the weighbridge.

Preliminary experiments with various manures suggested a promising field for investigation, and in September, 1913, a series of manurial tests were laid down to test the value of different manures on the yield of lucerne. Unfortunately, however, since 1913, there has been a chronic shortage of irrigation water owing to the breakdown of the water supply at Pyke's Creek Reservoir, and the value of the results of the tests has been considerably impaired.

The Plots.

The tests comprise trials of nitrogenous, potassic, and phosphatic manures, stable manure, lime, and ground limestone.

The plots were each 10 chains long and .15 acre in area, and sown on land with a natural fall of 2½ inches to the chain, with the plots running along the contour lines and at right angles to the flow of the water. The plots were sown with Tamworth lucerne at the rate of 16 lbs. per acre in September, 1913.

During both 1914 and 1915 the Pyke's Creek Reservoir, upon which the Werribee Irrigation Settlement has hitherto depended, failed. Each irrigation season the lucerne received only three waterings during the growing season and this, combined with the deficient rainfall, prevented the lucerne making full development.

Had a full supply of irrigation water been available, it is certain that the yields would have been much higher than they were. As it was, only five cuts were obtained in the 1914-15 season, and but four cuts in 1915-16, instead of the customary six and seven cuts in a normal irrigation season. Each plot was cut separately with a mower and raked into windrows, cocked, and weighed over the weighbridge.

A sample of hay was taken from every load and the amount of dry matter determined so as to reduce the weights to a uniform basis for comparison. In all cases the returns have been calculated in terms of commercial hay (85 per cent. of dry matter).

The results are summarized in Table I.

TABLE I.—SHOWING WEIGHT OF LUCERNE HAY CUT FROM PLOTS TREATED WITH VARIOUS MANURES.

No. of Plot.	Treatment.	1914-15.	1915-16.	*Total Cut for Two Seasons.*
		tons cwt.	tons cwt.	tons cwt.
4	Lime 20 cwt. + Super 1 cwt. + Nitrate of Soda 1 cwt.	5 19·1	4 13·6	**10 12·7**
3	*Lime 20 cwt. + Stable Manure 10 tons* ..	5 9·0	5 3·6	**10 12·6**
1	Lime 20 cwt. + Super 2 cwt. + Blood Manure 1 cwt.	5 13·1	4 18·8	**10 12·4**
5	Lime 20 cwt. + Super 2 cwt. + Sulph. of Potash 1 cwt.	5 2·8	5 5·6	**10 8·4**
2	Lime 40 cwt. + Super 2 cwt.	5 4·2	5 16·8	**10 1·0**
9	Lime 20 cwt. + Super 2 cwt.	5 8·3	4 4·8	**9 13·1**
12	Super 2 cwt. only	5 11·0	4 1·6	**9 12·6**
8	Lime 20 cwt. + Thomas' Phosphate 2 cwt. ..	5 4·2	4 5·6	**9 9·8**
7	Lime 20 cwt. + Bonedust 2 cwt.	5 7·8	4 1·6	**9 9·4**
6	Lime only 20 cwt.	5 3·0	3 6·8	**8 10·6**
10	Ground Limestone 36 cwt.	4 16·8	3 13·6	**8 10·4**
11	No manure (*check plot*)	4 12·7	3 4·8	**7 17·5**

TABLE II.—SHOWING PROFIT PER ACRE FROM VARIOUS MANURES APPLIED TO LUCERNE.

No. of Plot.	Treatment of Plot.	Total Weight of Hay for Two Seasons.		Increase over Unmanured Plot.		Value of Increase per acre at £2 10s. per ton.			Cost of Manure per acre.			Net profit per acre over Unmanured Plot.		
		tons	cwt.	tons	cwt.	£	s.	d.	£	s.	d.	£	s.	d.
4	Lime 20 cwt., Super 2 cwt., Nitrate of Soda 1 cwt. ..	10	12·7	2	15·2	6	18	0	2	15	0	**4**	**3**	**0**
1	Lime 20 cwt., Super 2 cwt., Blood Manure 1 cwt. ..	10	12·4	2	14·9	6	17	3	2	9	3	**4**	**8**	**3**
3	Lime 20 cwt., Stable Manure 10 tons	10	12·6	2	15·1	6	17	9	2	15	0	**4**	**2**	**9**
5	Lime 20 cwt., Super 2 cwt., Sulph. of Potash 1 cwt. ..	10	8·4	2	10·9	6	7	3	2	15	0	**3**	**12**	**3**
9	Super only 2 cwt.	9	12·6	1	15·1	4	7	9	0	10	0	**3**	**17**	**9**
8	Lime 20 cwt., Super 2 cwt...	9	13·1	1	15·6	4	9	0	2	0	0	**2**	**9**	**0**
10	Lime 20 cwt, Basic Slag 2 cwt.	9	9·3	1	12·3	4	0	11	2	0	0	**2**	**0**	**11**
7	Lime 20 cwt., Bonedust 2 cwt.	9	9·4	1	11·9	3	19	9	2	2	0	**1**	**17**	**9**
2	Lime 40 cwt., Super 2 cwt. ..	10	1·0	2	3·5	5	8	9	3	10	0	**1**	**18**	**9**
6	Lime only 20 cwt. per acre	8	10·6	0	13·1	1	12	9	1	10	0	**0**	**2**	**9**
10	Ground Limestone 36 cwt. per acre	8	10·4	0	12·9	1	12	3	1	11	6	**0**	**0**	**9**
11	Nil (Control Plot)	7	17·5	Nil		Nil			Nil			Nil		

In computing the above results, the approximate cost of the fertilisers on the farm was taken as a basis of comparison. The values per for the artificial fertilisers were—Ground lime, 30s.; ground lime- 17s. 6d.; superphosphate, £5; basic slag, £5; bonedust, £6; anure, £9; nitrate of soda, £15; sulphate of potash, £15.

A perusal of these returns will give some interesting comparisons. Taking the results for the two years the following deductions would seem to be permissible:—

1. *The Use of Lime and Ground Limestone.*—The application of lime or ground limestone has increased the yields of hay by 12½ cwt. per acre. There is practically no difference in yield between the results from a ton of lime per acre and its equivalent in the form of ground limestone (36 cwt.). It will be seen that the first season the quick lime gave a better return than the ground limestone, but in the second year the returns were reversed. So far as the profit is concerned, it will be seen that, with lucerne hay averaging 50s. per ton over a period of years, the increased return for the two years is just sufficient to cover the cost of the manure and its application. In fairness to the lime and ground limestone it should be added that the effects of these applications are likely to persist for more than two years, and the whole cost of the manure therefore should not be debited to the

Fig. 2.—View of Fifty-acre Block of Lucerne, Fertilised with 2 cwt. Superphosphate per acre, State Research Farm, Werribee.

first two seasons' returns. Moreover, had more irrigation water been available, it is probable that the differences in yield compared with the unmanured plot would have been still more striking.

2. *The Value of Phosphatic Manures for Lucerne.*—The results unmistakably demonstrate the value of phosphatic manures for lucerne, and particularly superphosphate. A comparison of the yields from Plots 7, 8, and 9 (lime with 2 cwt. phosphate) with that from Plot 6 (lime only) shows that the addition of 2 cwt. of a water soluble (super), a citrate soluble (basic slag), or an insoluble phosphate (bone dust) increases the yield of hay by a ton per acre.

As 2 cwt. of the phosphate costs but 10s. to 12s. the profit on the outlay is at least £2 per acre. It will be noted, however, that when superphosphate and 20 cwt. lime are applied in combination the yields are practically the same as super applied by itself. Thus Plot 12, treated with super 2 cwt. gave 9 tons 12.6 cwt., whilst the addition

of a ton of lime (Plot 9) increased the yeld of hay by only a half hundredweight.

Even the addition of an extra ton of lime (Plot 2) gave only 8 cwt. extra of hay over Plot 9, an increase which would not cover the cost of the additional manure. Moreover, of all the phosphatic manures it will be noted that super is the most effective.

3. *Nitrogenous Manures*.—One of the most striking features of the table is the effect of the nitrogenous manures on the hay yield. Lucerne belongs to the family of leguminosæ, all the members of which are capable of extracting the nitrogen of the air. So far as is known, this power of utilizing the nitrogen of the air is exclusively possessed by this class of plants. For this reason peas, beans, clover, lucerne, and other such plants are used as much as possible in building up a rotation which will conserve the fertility of the soil.

The curious wart-like nodules found on the roots of healthy lucerne, peas, beans, vetches, and clover plants are really colonies of bacteria

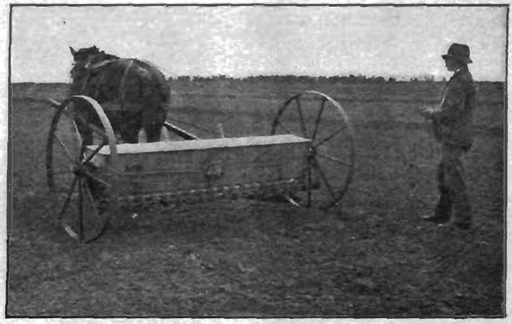

Fig. 3.—View of Lime Spreader Applying Lime to Land prior to Sowing Down with Lucerne.

engaged in the work of assimilating free nitrogen from the soil air, and transforming it into forms suitable for absorption by the plants. It is usually considered unnecessary to add nitrogenous manures to leguminous crops, even though the soil be naturally poor in nitrogen. If nitrogenous manures are applied to these crops they will make use of it, and correspondingly less nitrogen will be absorbed by the bacteria.

The question that concerns the farmer is whether the application of nitrogenous manures is a profitable practice. Whatever may be said of the policy of using nitrogenous manures on lucerne, the results at Werribee suggest that the practice is profitable.

Compare, *e.g.*, Plot 4 with Plot 9. Both plots have a uniform dressing of lime and super, but Plot 4 has, in addition, a dressing of 1 cwt. of nitrate of soda. The increase in yield due to this dressing is 19½ cwt., an increase worth 48s. 9d. per acre, and obtained by expending an additional 15s. in nitrate of soda.

A similar result is obtained on Plot 1, which received a dressing of blood manure, in addition to super and lime. Here the increase was *19.3* cwt. over Plot 9, an increase worth 48s. 3d. per acre, obtained by an added expenditure of 5s. per acre.

4. *Stable Manure.*—Observe also the results from stable manure. Ten tons of stable manure gave practically the same effect as a combined dressing of 2 cwt. of super and 1 cwt. of nitrate of soda. Its effects are more likely to persist than the other nitrogenous manures, and its effects should be noticed for some years.

Plot 3 should really, however, be compared with Plot 6. Lime alone gave a total yield of 8 tons 10.6 cwt. The addition of 10 tons of stable manure resulted in an increase of 2 tons 2 cwt. per acre, worth £5 5s. As the labour involved in its production would not exceed 2s. 6d. per ton, the net profit per acre is at least £2 5s.

Stable manure has an additional advantage over the other manures applied. It is bulky, and when applied in winter as a top dressing and

Fig. 4.—View of Lucerne Spring-tooth Cultivator at Work, State Research Farm, Werribee.

cultivated in it helps to prevent surface caking, and thus acts as a mulch as well as permitting the air and water to penetrate the soil.

Lucerne Makes a Heavy Drain on the Soil.

Even if the results of manurial tests were not available, a moment's reflection on the quantity of nutrients removed from the soil by a lucerne crop would suggest the possible advantage of liberal dressings of manures, particularly phosphates. In considering the quantity of plant nutrients removed by a lucerne crop, we will suppose that the whole of the crop is removed in the form of hay. Under these circumstances Plot 11, yielding 7 tons 17½ cwt. per acre, would remove the following nutrients per acre:—

Nitrogen, 321 lbs. per acre.
Potash, 348 lbs. per acre.
Phosphoric acid, 65 lbs. per acre.
Lime, 349 lbs. per acre.

Now contrast this with the amount removed by a 30-bushel wheat crop. If the grain is carted off the farm, and the straw burnt *in situ*, or ploughed in, a 30-bushel crop of grain will remove—

Nitrogen, 34 lbs.
Potash, 9.3 lbs.
Phosphoric acid, 14.2 lbs.
Lime, 2 lbs.

These figures should give some idea of the tremendous foraging power of lucerne. The worst plot on the Experimental Field at Werribee in two years removed from the soil—

9 times as much nitrogen as a 30-bushel wheat crop.
36 times as much potash as a 30-bushel wheat crop.
172 times as much lime as a 30-bushel wheat crop.
4.5 times as much phosphoric acid as a 30-bushel wheat crop.

Now, experience has shown that wheat lands are generally deficient in phosphoric acid, and that superphosphate must be sown with the seed if profitable crops are to be reaped. What then must we say of a crop which uses up every two years enough phosphoric acid to supply the needs of nearly five 30-bushel wheat crops? And since phosphoric acid is the most deficient plant food in our Australian soils, it follows that the fertilizers applied should contain a substantial amount of phosphates.

There are now very few wheat farmers in Victoria who fail to apply phosphatic manures with every crop of wheat they sow. Experience has taught them that phosphates are absolutely essential for successful cropping. How much more essential should it be to apply an occasional dressing of phosphates to an established lucerne crop, grown in many cases on worn out wheat lands.

It will be seen, too, that lucerne makes a heavy drain on the potash supplies of the soil. Victorian soils, however, are generally well supplied with potash, and the average wheat soil contains at least 2 per cent., or 7,000 lbs. of potash for each acre-foot of soil. The subsoils are even richer. Only a small portion (possibly not more than 1 per cent. of the total potash in the soil) is available for the use of the crop at any given moment. The use of such soil amendments as lime, gypsum, and ground limestone, helps to liberate some of the insoluble phosphates and potash of the soil, and this explains the increased returns of lucerne following the use of dressings of lime.

Regarding the nitrogen supply, the lucerne plant is, of course, able to draw on the supplies of nitrogen from the air, and probably the greater part of the nitrogen gathered by the plant comes from this source. Of course, if the whole of the crop is removed in the form of hay, then the drain on the nutrients of the soil is considerable. If the lucerne is grazed, however, or consumed on the farm by live stock and the droppings returned as top dressings, approximately one-third to one-half of these nutrients are returned to the soil, the balance being utilized to maintain the animals, and build up muscle, flesh, and bone.

These figures are certainly striking, and they explain why old lucerne fields are so productive for some years after their renovation. It is particularly noticeable on the irrigation settlements, where old lucerne fields are broken up and sown with forage and grain crops prior to re-sowing down with lucerne. The large quantities of nutrient material,

articularly nitrogen, accumulated by the lucerne roots during the time t occupied the ground, are gradually made available to these crops. This reserve of plant food, together with the amount normally supplied by the soil, is sufficient to provide for the demands of the heaviest crops. Crops like sorghum, ambercane, imphee, maize, &c., grow particularly well.

One other point needs to be mentioned. Most farm crops secure heir mineral nutrients from near the surface. Lucerne, on the other hand, can penetrate the soil to a great depth. At Bacchus Marsh and Tamworth the roots have been traced to a depth of 30-35 feet.

Near Tamworth, New South Wales, many old paddocks of lucerne have been undermined by the eroding action of the Peel and the Cockburn rivers, and the root system to a depth of 30 feet exposed to full view.

Though the total amount of plant food removed per acre by lucerne s considerable, it must be borne in mind that a goodly quantity of this material is gathered from regions inaccessible to the roots of ordinary farm crops.

The reader will see that the lucerne crop makes a heavy drain on the mineral constituents of the soil. He may infer that lucerne is an ex-

Fig. 5.—Cutting Crops on Lucerne Manurial Plots, State Research Farm, Werribee.

hausting crop, and that its continual growth will deplete the soil of its fertility. There is no doubt that lucerne, as compared with cereal crops, does make heavy calls on the soil; but the old adage "One cannot eat the cake and have the cake" applies here. A large crop of high nutritive value cannot be produced without removing from the soil large quantities of plant food.

The amount of plant food removed from the soil by any given crop is, roughly, proportionate to the size of the crop. The skilful cultivator endeavours to raise as big a crop as possible, and recognises that the larger the crop, the more the necessity for replacing some of the nutrients removed by the crop.

Large Amount of Plant Food Stored Up in Lucerne Roots.

It may be of interest in passing to briefly indicate the amount of plant food stored up in the lucerne roots. A number of lucerne plants were grown at Rutherglen during 1914-15 in deep pots to gather information as to the ratio of root development to overhead growth, and the amount of plant food stored up by the roots.

It was found as an average of a number of tests that the root growth was equal to 22 per cent. of the overhead development. The average composition of the roots was—nitrogen, 2.1 per cent.; phosphoric acid, .5 per cent.; potash, 1.1 per cent.; and lime, 1.2 per cent. Applying these results to the unmanured plot mentioned above, the total weight of roots formed during the two years would be equal to 47 cwt. of dry roots and root hairs per acre. Hence, there would remain in the roots of this crop—

Nitrogen, 69.2 lbs.
Phosphoric acid, 16.2 lbs.
Potash, 36.0 lbs.
Lime, 39.6 lbs.

These figures will give some idea of the enormous foraging power of the root system of lucerne.

Fig. 6.—Curing Hay on Lucerne Manurial Plots, State Research Farm, Werribee.

The Wonderful Foraging Power of Lucerne.

In other words, during the space of two years the unmanured plot of lucerne took from the soil enough phosphoric acid to supply the needs of five 30-bushel wheat crops, and left behind in its roots more than enough of the same ingredient to bring a 30-bushel crop to maturity. It took from the soil in two years enough nitrogen to supply nine 30-bushel wheat crops, and it left behind in its roots enough nitrogen for more than *two* such crops.

Finally it removed potash in two years sufficient to supply thirty-six wheat crops, and at the same time there was enough left in its roots to furnish potash for *four* wheat crops.

Time and Manner of Applying Fertilisers.

The most suitable time to apply top dressings to established lucerne is in August, just before the soil temperatures begin to rise. The lucerne may be grazed with sheep towards the end of July, or early in August, if the soil is dry enough to carry them without puddling the

surface. The sheep will clean up all weeds and crop the lucerne fairly close. After the sheep are removed, the cultivator should be run over the lucerne, and the tines of the cultivator allowed to work to a fair depth.

There are many types of lucerne cultivators on the market. The ideal machine is one that is light of draught, stirs the soil to a good depth, and does the minimum of damage to the lucerne. On the whole, the spring-tooth cultivator fulfils these conditions fairly well. In Fig. 4 is a view of a lucerne cultivator at work on a 50-acre field of lucerne at the State Research Farm, Werribee. The lucerne depicted in the illustration was closely grazed with sheep and then deeply cultivated in two directions at right angles early in August. This permits access of air to the lucerne roots and puts the soil in good condition for absorbing the spring rains. The artificial fertilisers may then be applied with

Fig. 7.—Carting Produce of Lucerne Manurial Trials to the Weighbridge.

the drill. Lime is most conveniently applied with a lime spreader (*vide* Fig. 3), and is best applied by itself a week or so before the application of phosphatic fertilisers.

Summary.

The results of tests conducted at the State Research Farm, Werribee, during the past two years demonstrate that the yields of lucerne hay may be considerably increased by the application of suitable fertilizers.

(1) Lucerne sown without manure gave in two years a total yield of *7 tons 17½ cwt. of commercial hay.*

(2) Lime applied at the rate of 1 ton of lime per acre, or its equivalent in the form of ground limestone, enabled crops of 8½ tons to be reaped—an increase of 13 cwt.—which was sufficient to cover the cost of the manure.

(3) The addition of phosphates, no matter whether in the form of super, basic slag, or bone dust, *enabled the limit of production to be* raised to 9 tons 13 cwt.—an increase of 35 cwt.—which was very profitable.

(4) Of all the phosphatic manures super was the most effective. It was almost as effective applied by itself as when applied in conjunction with lime.

(5) There is no manure that is likely to give the lucerne grower such substantial and profitable results as the dressing of 2 cwt. of super applied every two years. For an outlay of 10s. per acre (Plot 12) an increase of 35 cwt. was secured, valued at £4 7s. 6d.

(6) The addition of nitrogenous manures, combined with super and lime, enabled the limit of production to be raised to 10 tons 12½ cwt., an increase of 2⅜ tons as compared with the no-manure plot.

(7) *Despite the fact that the lucerne can secure nitrogen from the* air, the tests show that, on Werribee soils, the application of nitrates is likely to be a profitable practice.

(8) Stable manure in dressings of 10 tons per acre is a most valuable manure for lucerne, especially on worn-out soils, such as those at Werribee. Not only does it give as good a return as a combination of super and nitrate of soda, but it helps to keep the soil open and acts as a mulch.

(9) Lucerne makes a heavy drain on the mineral constituents of the *soil. The unmanured plot of lucerne at Werribee in two years removed* from the soil 4½ times as much phosphoric acid, 9 times as much nitrogen, and thirty-six times as much potash as a 30-bushel wheat crop. This alone, apart from a consideration of the actual results of tests, is sufficient to suggest to the farmer the need for liberality in applying artificial fertilisers.

(10) Lucerne also leaves in the soil large quantities of mineral food gathered from the regions beyond the reach of ordinary farm crops. In two years the unmanured lucerne plot had stored up in its roots enough phosphoric acid to supply the need of a 30-bushel wheat crop, enough nitrogen for two such crops and enough potash for four such crops. That is the reason why cereal and fodder crops thrive so well on soil that had been sown to lucerne for a number of years.

(11) It is suggested that the lucerne fields be grazed in winter, cultivated with a spring-tooth cultivator, and top-dressed, either with 2 cwt. of super every two years, or with 1 cwt. of super per acre every winter.

Cereal farmers never fail to apply phosphates to their cereal crops. At the present time, very few lucerne growers top-dress their lucerne fields with artificial manures. The Werribee *results show that there* would be a handsome profit in the practice.

EXPERIMENTS IN THE CULTIVATION OF POTATOES, 1915-1916.

By J. T. Ramsay, Potato Expert.

The following report and comment, relative to the experimental work in potato cultivation conducted by the Department during the season 1915-16, is submitted herewith:—These tests were carried out at three different centres, viz., Leongatha, Koo-wee-rup, and Portland, and were designed and undertaken with the object of getting practical demonstration of the effects of varying treatments of the crop, the best of which are feasible of adoption into the farm practice of growers for the benefit of their soils, their crops, and their pockets. The climatic conditions governing the crop of the season were extreme in their variations. The genial weather experienced at planting time proved to be the start of a period of drought which lasted over two months. During this time the thorough preparatory and inter-cultivation which was given to the plots was severely tried in its counteraction to the baneful effects of a distressing sequence of dry days which were unpleasantly and consistently favoured by an abundance of moisture-stealing winds.

This spell of drought was particularly favorable to the spread of the notorious Rutherglen Bug (*Nysius Vinitor*) which made its appearance at Leongatha about the middle of January, and threatened the crop with destruction.

Fortunately its advent was noticed and steps combative to it were immediately taken. Numerous smudge fires made from waste straw, bagging, &c., were set burning in such positions as would allow the wind to carry the smoke over the crop, and to each fire was added a handful of sulphur. The result was effective. The whole area treated was soon enveloped with the pungent and suffocating smoke, which had the effect of either killing or driving off the insects. No further visitation of this pest was experienced.

Good rains fell during the third week in January, and improved the aspect. The crop responded and was favoured with genial climatic environment for the remainder of the maturation period.

LEONGATHA.

At Leongatha an area of 5½ acres was subdivided into seven sections which had objectives as follows:—

1. The effect on the crop of phosphatic, potassic, and nitrogenous manures in varying combinations, and at varying rates of application per acre.
2. The effect of dipping seed in an antiseptic solution, and spraying the crop with a fungicidal preparation, as disease preventives.
3. The effect on the yield of varying depths of planting the seed.
4. The effect on the yield of varying spacings between the sets.
5. The respective influences on the yield of immature and ripe seed.
6. The cropping capabilities of different varieties.
7. The propagation of new varieties.

Planting was finished on this area on 17th November, 1915. The soil, in which these tests were made at Leongatha, is a grey loam, which is very deficient in phosphoric acid and potash, as is shown by the analysis.

ANALYSIS OF LEONGATHA SOIL.

Parts per 100,000.

—	Soil.	Subsoil.	For comparison, a Good Soil should contain—
Nitrogen	157	87	150
Phos. Acid	45	70	150
Potash	58	35	250
Lime	136	204	500
Magnesia..	112	84	Not more than lime
Chlorine	14	12	Not more than 35
Reaction	Acid	Acid	Neutral to slightly alkaline

The following tables give the results obtained in the different sections:—

SECTION 1.—MANURE TESTS.

—	Tons per Acre.			Increase, due to Manure.		
	tons	cwt.	lbs.	tons.	cwt.	lbs.
1. No manure (average of four Sections)	3	7	56	..		
2. 3 cwt. Super.	5	15	0	2	7	56
3. 3 cwt. Basic Phosphate	5	5	0	1	17	56
4. 3 cwt. Blood and Bone	4	5	0	0	17	56
5. 3 cwt. Potato Manure	4	7	56	1	0	0
6. 1 cwt. Sulphate of Potash, 3 cwt. Blood and Bone ..	4	17	56	1	10	0
7. 1 cwt. Sulphate of Potash, 3 cwt. Super.	5	10	0	2	2	56
8. 3 cwt. Super., 1 cwt. Sulphate of Potash, 1 cwt. Sulphate of Ammonia	5	15	0	2	7	56
9. 3 cwt. Super., 1 cwt. Sulphate of Potash, 2 cwt. Blood ..	6	8	84	3	1	28
10. 6 cwt. Super., 1½ cwt. Sulphate of Potash, 1½ cwt. Sulphate of Ammonia	9	7	56	6	0	0
11. 9 cwt. Super., 3 cwt. Sulphate of Potash, 3 cwt. Sulphate of Ammonia	10	2	56	6	15	0

In every case an increased weight of the crop was obtained from the application of manures, and the amount of the increase was fairly proportionate to the amount of manure applied. Some doubt was expressed at the beginning of the season as to whether the fairly heavy dressings of 9 cwt. and 15 cwt. applied to sub-sections 10 and 11 respectively, would prove profitable. The following table, which expresses the results of these manurial trials in money values, settles this doubt.

In computing, the values of the manures used, have been taken at the rates per cwt. shown hereunder:—

Superphosphate, 4s. 6d.; sulphate of potash, 14s.; sulphate of ammonia, 16s.; blood and bone, 7s.; basic phosphate, 4s.; potato manure, 6s. 6d.; blood, 6s. 9d.

The value of the crop has been reckoned at £5, a rate which must be admitted moderate when the prices of the past two seasons are considered.

RESULTS OF MANURE TESTS IN MONEY VALUES.

Rates per acre.

—	Gross Value at £5 per Ton.	Cost of Manure.	Cash Increase, after paying for Manure.
	£ s. d.	£ s. d.	£ s. d.
No Manure	16 17 6	..	..
3 cwt. Super.	28 15 0	0 13 6	11 4 0
3 cwt. Basic Phosphate	26 5 0	0 12 0	8 15 6
3 cwt. Blood and Bone	21 5 0	1 1 0	3 6 6
3 cwt. Potato Manure	21 17 6	0 19 6	4 0 6
1 cwt. Sulphate of Potash, 3 cwt. Blood and Bone	24 7 6	1 15 0	5 15 0
1 cwt. Sulphate of Potash, 3 cwt. Super.	27 10 0	1 7 6	9 5 0
3 cwt. Super., 1 cwt. Sulphate of Potash, 1 cwt. Sulphate of Ammonia	28 15 0	2 3 6	9 14 0
3 cwt. Super., 1 cwt. Sulphate of Potash, 2 cwt. Blood	32 3 9	2 1 0	13 5 3
6 cwt. Super., 1½ cwt. Sulphate of Potash, 1½ cwt. Sulphate of Ammonia	46 17 6	3 12 0	26 8 0
9 cwt. Super., 3 cwt. Sulphate of Potash, 3 cwt. Sulphate of Ammonia	50 12 6	6 10 6	27 4 6

These figures should be more than interesting to potato growers.

In every case there is shown a cash increase after paying for manure, and, here is the strongest possible evidence of the fact that the more liberal the expenditure on suitable manures, the bigger is the margin of profit which accrues.

Not many growers in the State apply dressings up to the heavier weights tested at Leongatha. Yet these figures, and those of last year, show that where soil is deficient in the necessary quantity of plant food, liberal manuring is a sound investment which returns a handsome interest. The building up of fertility by manuring increases land values per acre, by increasing its potential productiveness.

SECTION 2.—DIPPING AND SPRAYING TEST.

In this section the variety "Up-to-date" was subjected to the treatments indicated in the accompanying table. All the seed used was taken from one parcel, and was clean. The dipping solution for seed was made from 1 oz. of corrosive sublimate to 6 gallons of water and the seed was immersed in this for one and a half to two hours. The spraying solution was made from copper sulphate, 2 lbs.; washing soda, 2½ lbs.; to 10 gallons of water. Under all treatments the resulting crop was clean so that the test for this season has no practical value.

The following weights were recorded, which show variations insufficient for remark:—

	tons	cwt.	lbs.
Dipped at Planting, and Sprayed	5	13	8
Dipped at Digging, and Sprayed	5	2	96
Dipped at Planting, not Sprayed	5	6	8
Dipped at Digging, not Sprayed	5	7	4
Sprayed only	5	11	8
Untreated	4	17	96

Section 3.—Depth of Planting Test.

In this test the shallower planted sets, viz., 3 inches and 3½ inches, came away most quickly at the beginning of the season, but were more severely affected by the long spell of dry weather, and consequently finished with a lighter crop than those planted at depths of 4 inches and over.

The figures resulting from the various depths indicate that 4 inches to 5 inches were the most suitable for this season. This test will be repeated.

Depth of Planting Test.

	tons	cwt.	lbs.
3 inches deep	2	14	0
3½ inches deep	3	15	0
4 inches deep	4	16	8
4½ inches deep	4	12	96
5 inches deep	5	2	96
6 inches deep	4	10	40

Section 4.—Spacing Test.

Four spacings were used in this section, viz., 12 inches, 15 inches, 18 inches, and 21 inches, and the results bear out the expectation that the closer plantings would produce the heavier yields. Besides yielding the heavier tonnage, the tubers from the closer spacings were of a more even size than those grown at 18 inches to 21 inches apart. In many parts of the State growers are inclined to be too sparing in the use of seed, some making a practise of using as little as 7 cwt. to seed an acre of ground. This is undoubtedly a mistake. When sets are placed, say, 20 inches apart in the rows, the tendency is for the tubers produced to be too large and coarse. Thicker seeding produces heavier tonnages of better quality potatoes. This is borne out by the fact that the competitors who score highest in the field crop competitions are those who use fair-sized seed sets and plant them closely.

The following weights were obtained from the various spacings:—

Spacing Test.

	tons	cwt.	lbs.
12 inches apart, x rows 2 ft. 3 in.	6	1	8
15 inches apart, x rows 2 ft. 3 in.	5	9	32
18 inches apart, x rows 2 ft. 3 in.	4	18	64
21 inches apart, x 2 ft. 3 in.	4	16	88

Section 5.—Immature *v.* Ripe Seed.

The seed used in this section was saved from the previous season's crop at Leongatha. Seven varieties were subjected to the trial. In the case of each variety the seed was secured at two stages of the growth of

the plants:—1. *Before* the crop was ripe, and, 2, *after* the crop had ripened. Both classes of seed were subjected to the same cultural treatment and were planted side by side.

The weights recorded in each case are tabulated below:—

IMMATURE AND RIPE SEED TEST.

Variety.	Immature.			Ripe.			Increase, due to Immature Seed.		
	tons	cwt.	lbs.	tons	cwt.	lbs.	tons	cwt.	lbs.
Sutton's	7	0	0	5	0	0	2	0	0
Factors	6	0	0	5	0	0	1	0	0
White Elephant	11	14	0	10	3	94	1	10	18
Carman I.	7	4	89	4	0	80	3	4	9
Early Norther	3	17	86	2	17	16	1	0	70
Black Prince	6	12	103	4	8	64	2	3	39
Gold Coin	4	19	70	3	16	88	1	2	94

It will be seen that there is a marked increase in favour of immature seed.

The increases vary from 1 ton per acre in the case of the "Factor" variety, to 3 tons 4 cwt. in the case of Carman I., *but the increase is constant* through all the varieties.

The accompanying table shows the relative cash returns per acre of the crops grown from immature and ripe seed:—

CASH VALUE OF CROP PER ACRE AT £5 PER TON.

Variety.	Immature.			Ripe.			Increase, due to Immature Seed.		
	£	s.	d.	£	s.	d.	£	s.	d.
Sutton's	35	0	0	25	0	0	10	0	0
Factors	30	0	0	25	0	0	5	0	0
White Elephant	58	10	0	50	18	9	7	11	3
Carman I.	36	3	9	20	3	9	16	0	0
Early Norther	19	8	9	14	3	6	5	2	3
Black Prince	33	5	0	22	2	6	11	2	6
Gold Coin	24	17	6	19	3	9	5	13	9

The smallest increase in value per acre is £5, and the greatest £16, both being appreciable. The average of the seven varieties in yield per acre and money value of crop is given herewith.

AVERAGE RETURNS OF SEVEN TESTS OF IMMATURE AND RIPE SEED.

	Immature.			Ripe.			Increase per Acre, due to Immature Seed.		
	tons	cwt.	lbs.	tons	cwt.	lbs.	tons	cwt.	lbs.
	6	15	65	5	1	1	1	14	64
	£	s.	d.	£	s.	d.	£	s.	d.
At £5 per ton	33	18	0	25	5	0	8	13	0

Nothing could be more convincing in proving the super-efficiency of immature seed as compared to ripe seed. The limit of argument should be reached when the subject is discussed in money values.

This result confirms the result of last year's demonstration, and confirms the result obtained in every case where immature and ripe seed are tried together.

It is gratifying to know that some of the leading growers in the State have adopted the practice of using immature seed and it should only be a matter of time before the rank and file have the superior worth of this class of seed driven home to them with sufficient force to cause them to follow the lead. There is no risk about the matter, it is beyond the experimental stage, it is a hard and definite fact that immature seed must be used if the heaviest crops are to be produced.

Section 6.—Variety Tests.

The following are the varieties which yielded the heaviest crops at Leongatha this season:—

	tons	cwt.	lbs.
White Elephant	11	14	0
Windsor Castle	8	14	0
Carman I	7	14	89
Sutton's Abundance	7	0	0
Black Prince	6	13	0
Up-to-date	6	1	0
Factors	6	0	0
Brown River	5	5	23
Peach Bloom	5	3	4
Gold Coin	4	19	70

Section 7.—New Varieties.

This year thirty-eight new varieties were tested. These were grown from seed supplied to this Department by Dr. Wilson, of St. Andrew's University, Scotland. Out of the thirty-eight sixteen produced crops of over 5 tons to the acre, and it is intended to further propagate these, and make the best of them available to growers. There are a number of them which give promise of being well worthy of inclusion amongst the varieties commercially grown in this State.

KOO-WEE-RUP.

At this centre an area of 2 acres was devoted to experimental work in the field cropping of potatoes. These were planted on 21st October, 1915. The objectives in this case were:—

1. Manurial tests.
2. Prolificacy of different varieties.
3. Normal seed *versus* weak seed.
4. Immature *v.* ripe seed.

The results obtained from the different manures at Koo-wee-rup varied in such an irregular manner as to render them of no value, therefore space will not be given to their tabulation. The only conclusion that could be drawn from them is that the fertility of the soil on the area planted varied, for some reason or other, to such an extent as to prevent the effect of the various dressings being distinguishable. The crops produced in sections 1, 3, and 4 are of some value, as these tests extended over all manures, and the results are therefore reported here.

SECTION 2.—VARIETY TESTS.

In this case five varieties were tested with the following results for the area planted:—

	tons	cwt.	lbs.
Adirondak	10	0	56
Factors	6	17	0
Carman I.	5	3	0
Cook's Favorite	4	18	56
Manistee	4	17	0

SECTION 3.—NORMAL SEED *v.* WEAK SEED.

When the Carman potatoes were being cut for planting it was decided to make a test between sets showing weak shoots and those with normally strong buds. The two classes of seed were planted side by side. From the time they came through the ground there was visible evidence that the sets with weak shoots were handicapped, and when the crop was dug this was supported by the weights recorded; these being:—

	tons	cwt.	lbs.
Normal Buds	7	12	77
Weak Buds	5	12	98

This makes practically a 2-ton to the acre difference in favour of the portion planted with sets showing fair strength in their shoots, and emphasises the advisability of discarding at planting time sets or tubers which show any evidence of lack of vigour.

SECTION 4.—*IMMATURE v.* RIPE SEED.

The Factor variety from Leongatha was used in this test at Koo-wee-rup. Ripe and immature seed of this variety were planted side by side with the following result:—

	tons	cwt.	lbs.
Immature Seed	7	17	56
Ripe Seed	6	17	0
Increase, due to Immature Seed	1	0	56

PORTLAND.

On the heath country at Cashmore-Portland experiments were carried out on two classes of soil, viz., "Hill" land, which takes its name from the fact that it is characteristic of the soil found on the higher parts of the undulations of the heath, and "Flat" land, so called because it is typical of the class of soil prevailing on the lower levels. Of the two soils the "Hill" land appears, to ocular observation of the uninitiated, to be the richer of the two, but, chemical analysis shows it to be but little different to the "Flat" land, in its content of plant food. Its cropping power up to the present has proved a dead loss, on account of the fact that no treatment of it has yet been found effective in making it produce any crop adequate to the expenditure involved in its production. No reason can be given here for this phenomenon. It

is possible that further cultivation, *i.e.*, working of this land may make it productive. Further analysis of it is being made now to determine whether it contains anything toxic to plant life. The "Flat" land has always proved responsive to manurial treatments. This is a grey, sandy soil of such a physical texture as permits it to be worked with ease at any season of the year, and it is well suited to the cultivation of potatoes and other root crops.

The analyses of the two classes of soil are given herewith:—

ANALYSIS OF CASHMORE HEATH "HILL LAND."

Parts per 100,000.

—	Soil.	Subsoil.
Nitrogen	118	72
Phos. Acid	11	8
Potash	16	9
Lime	82	62
Magnesia	86	66
Chlorine	8	8
Reaction	Acid	Acid

ANALYSIS OF CASHMORE HEATH "FLAT LAND."

Parts per 100,000.

—	Soil.	Subsoil.
Nitrogen	109	36
Phos. Acid	13	10
Potash	17	17
Lime	122	54
Magnesia	99	67
Chlorine	8	8
Reaction	Acid	Acid

Both analysis show a moderate content of nitrogen, but a great shortage in the necessary proportions of phosphoric acid and potash.

The objects aimed at in conducting these tests were:—

1. The relative efficiency of various manures.
2. Prolificacy of varieties.
3. Immature *v.* ripe seed.

Planting was completed at Cashmore on the 29th November, 1915, and the plots were harvested on the 9th June, 1916.

The results of the tests on the "Flat" land are given herewith:—

SECTION 1.—"FLAT" LAND.

Manure Tests—Un-Limed Portion.

Average of all varieties.

—	—			Value per Acre, at £5 per Ton.		
	tons	cwt.	lbs.	£	s.	d.
1. No Manure	1	15	0	8	15	0
2. 4½ tons Stable Manure	7	0	0	35	0	0
3. 4 cwt. Potato Manure	5	0	0	25	0	0
4. 4 cwt. Blood	2	15	0	13	15	0
5. 4 cwt. Blood and Bone	3	5	0	16	5	0
6. 4 cwt. Blood and Bone, 1 cwt. Sulphate of Potash ..	4	10	0	22	10	0
7. 2 cwt. Basic Phosphate, 2 cwt. Blood, 1 cwt. Sulphate of Potash	5	10	0	27	10	0
8. No Manure	1	15	0	8	15	0
9. 6 cwt. Super.	4	15	0	23	15	0
10. 4 cwt. Super., 1 cwt. Sulphate of Potash, 1 cwt. Sulphate of Ammonia	6	5	0	31	5	0
11. 4 cwt. Super., 1 cwt. Sulphate of Ammonia	4	15	0	23	15	0
12. 4 cwt. Super., 1 cwt. Sulphate of Potash	5	15	0	28	15	0
13. 4 cwt. Super., 1 cwt. Sulphate of Ammonia, 2 cwt. Sulphate of Potash	8	15	0	43	15	0
14. No Manure	1	15	0	8	15	0

A remarkable result obtained here is the large increase in the crop caused by the application of a very small dressing of stable manure of 4½ tons to the acre. The crops grown on the plots treated with phosphoric acid and potassic manures also showed a marked increase thereby demonstrating the need of such manures in this soil. On the limed sub-section the results of which follow, similar increases were harvested, which further proves the responsiveness of this land to manuring. The application of lime at the rate of 1 ton per acre gave no noticeable results this season, probably due to the fact that it was applied somewhat late. Its effect will probably be marked in next year's crop.

MANURE TESTS—LIMED PORTION.

—	—			Value per Acre, at £5 per Ton.		
	tons	cwt.	lbs.	£	s.	d.
1. No Manure	1	15	0	8	15	0
2. 4½ tons Stable Manure	6	15	0	33	15	0
3. 4 cwt. Potato Manure	4	15	0	23	15	0
4. 4 cwt. Blood	3	0	0	15	0	0
5. 4 cwt. Blood and Bone	3	15	0	18	15	0
6. 4 cwt. Blood and Bone, 1 cwt. Sulphate of Potash ..	4	5	0	21	5	0
7. 2 cwt. Basic Phosphate, 2 cwt. Blood, 1 cwt. Sulphate of Potash	5	5	0	26	5	0
8. No Manure	1	15	0	8	15	0
9. 6 cwt. Super.	4	5	0	21	5	0
10. 4 cwt. Super., 1 cwt. Sulphate of Ammonia, 1 cwt. Sulphate of Potash	6	0	0	30	0	0
11. 4 cwt. Super., 1 cwt. Sulphate of Ammonia	5	10	0	27	10	0
12. 4 cwt. Super., 1 cwt. Sulphate of Potash	7	15	0	38	15	0
13. 4 cwt. Super., 1 cwt. Sulphate of Ammonia, 2 cwt. Sulphate of Potash	8	5	0	41	5	0
14. No Manure	1	15	0	8	15	0

These results give a glaring example of the effectiveness of manuring *on this class of soil. In order that this may be the more clearly demonstrated* the following tabulation of the net cash increases in the value of the crop under the various manurings is given:—(Rate per ton £5).

TABLE SHOWING CASH INCREASES PER ACRE DUE TO MANURING.

—	Cost of Manure per Acre.			Cash Increase after Paying for Manure.		
	£	s.	d.	£	s.	d.
1. No Manure	..			..		
2. 4½ tons Stable Manure	2	5	0	24	0	0
3. 4 cwt. Potato Manure	1	6	0	14	9	0
4. 4 cwt. Blood	1	6	0	3	14	0
5. 4 cwt. Blood and Bone	1	8	0	6	2	0
6. 4 cwt. Blood and Bone, 1 cwt. Sulphate of Potash ..	2	2	0	11	13	0
7. 2 cwt. Basic Phosphate, 2 cwt. Blood, 1 cwt. Sulphate of Potash	1	15	0	17	0	0
8. No Manure	..			..		
9. 6 cwt. Super.	1	7	0	13	13	0
10. 4 cwt. Super., 1 cwt. Sulphate of Ammonia. 1 cwt. Sulphate of Potash	2	8	0	20	2	0
11. 4 cwt. Super., 1 cwt. Sulphate of Ammonia	1	14	0	13	6	0
12. 4 cwt. Super., 1 cwt. Sulphate of Potash	1	12	0	18	8	0
13. 4 cwt. Super., 1 cwt. Sulphate of Ammonia, 2 cwt. Sul-	*3*	*2*	*0*	*31*	*18*	*0*
phate of Potash	3	2	0	31	18	0
14. No Manure	..			..		

SECTION 2.—VARIETY TESTS.

Six varieties subjected to the same treatment were grown side by side. These produced the recorded weights:—

	tons	cwt.	lbs.
Brownell's Beauty	5	11	8
Up-to-date	5	4	72
Sutton's Abundance	5	17	56
Scruffle	3	7	16
Clark's Main Crop	6	0	0
Early Norther..	4	1	8

All of these turned out a fine sample, and were clean and free from disease.

SECTION 3.—IMMATURE *v.* RIPE SEED.

As at Leongatha and Koo-wee-rup the Cashmore test of these two classes of seed was strong in its proof of the profitableness of using immature seed. The variety used was Sutton's Abundance, grown last season at Leongatha.

The crop resulting was:—

	Per Acre tons	cwt.	lbs.
Immature Seed	5	13	14
Ripe Seed	2	5	0
Increase, due to Immature Seed	3	8	14

This expressed in money means that every acre grown from immature seed under the Cashmore conditions of 1915-16 (with potatoes at £5 per ton) would be worth £17 1s. 3d. more than that grown from ripe seed—surely enough evidence of its value to induce growers to use it.

APPLE CULTURE IN VICTORIA.

By J. Farrell, Orchard Supervisor.

The Apple (*Pyrus Malus*).

For many centuries the apple has been the most extensively grown, universally popular, prolific, and profitable of our cultivated commercial fruits.

It belongs to the natural order *Rosaceæ*, and is capable of adapting itself to a wide range of soil and climatic conditions, consequently it is cultivated in all the civilized countries of the world.

During the long period throughout which the apple has been in use, and, compared with other fruits, it has had no equal as a tonic, food and blood purifier.

Since the apple was introduced into Victoria the area under its cultivation has steadily increased from year to year until its production has become one of our chief national industries.

A ripe apple contains acid, sugar, fat, lime, phosphorus, protein, carbohydrates, magnesia, &c. The proportions, beautiful combinations, and blending of these chemicals, as in the apple, constitute a food which is procurable only through Nature's dispensary.

When writing of the apple in England, Hogg states:—"There is no fruit in temperate climates so universally esteemed and so extensively cultivated, nor is there any which is so closely identified with the social habits of the human species as the apple. Apart from the many domestic purposes to which it is applicable, the facility of its cultivation and its adaptation to every latitude have rendered it in all ages an object of special attention and regard. There is no part of our island where one or other of its numerous varieties are not cultivated, and few localities where the fruit cannot be brought to perfection. The apple is a native of this, as well as almost every other country in Europe. Its normal form is the common Wild Crab *Pyrus Malus* of Linnæus, and the numerous varieties with which our gardens and orchards abound are the result either of the natural tendency of that tree to variation, or by its varieties being hybridized with the original species or with each other."

During the eighteenth and nineteenth centuries the varieties have been considerably increased in number, and point of size and quality much improved, not only by means of interpollination and the consequent cross-fertilization of selected varieties, but also by the propagation of chance seedlings and "sports," and by careful cultivation and general good management.

As the early ripening varieties now grown lack not only quality, but perish in a remarkably short time, it is the duty of horticulturists of the present day to win from Nature's inexhaustible store the apple that is desired.

There is a good supply of mid-season and late ripening sorts suitable for oversea and Inter-State markets.

While in search of the early varieties, others might be found which would thrive better under warm soil and climatic conditions, irrigation, &c., than some of those at present grown. In addition, also, if a variety resistant to black spot (*Fusicladium dendriticum*) and bitter pit could be evolved, incalculable benefit would be bestowed on the fruit-grower.

Most kinds of fruits have to be consumed when in season because they keep, as fresh fruit, only a few weeks or, in some instances, even a few days. They may, however, be preserved or converted into by-products, but apples can be kept much longer fresh than most other fruits, even under ordinary conditions. But since the advent of cool storage they may even be kept as fresh fruit all the year round, and the surplus converted into many valuable commercial by-products as well, viz., dried apples, cider, jelly, spirit, pomade, &c. Apples are also largely used in the manufacture of jams.

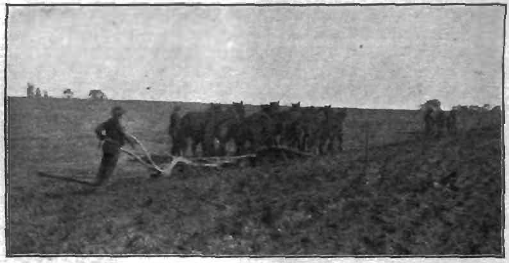

Plate 1.—Ploughing and Subsoiling.

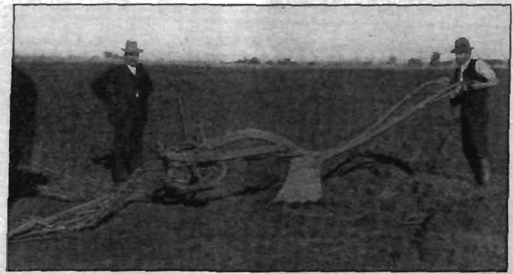

Plate 2.—Subsoil Plough.

The present, and perhaps the immediate future are ours, therefore all persons interested in apple culture should become, if not already, active students of pomology, so that they may learn and practise all the essentials to scientific and successful apple culture, and thus be in a position to hand down to the next generation the apple with possible improvements on its useful and glorious past.

When the Commonwealth Industrial Research Bureau is being established it might include a few original scientific investigators, thoroughly equipped, to further explore the regions of horticultural research.

The Government of Victoria has taken steps to instruct returned soldiers who wish to take up fruit growing as their future occupation at the Dookie College, and the Department of Agriculture is desirous that the Orchard Supervision Branch should work in harmony and co-operation with the officers of the college in this regard.

It is realized that the soldiers will have to fight an uphill battle until their orchards come into bearing.

These articles are intended to be of some service, so that the nucleus of our new horticultural army may be equipped with practical and reinforced with scientific knowledge to enable it to successfully attack any Anzac barriers that may arise between itself and successful fruit growing.

It is proposed to include all the details relative to apple culture in this series of articles, with illustrations, to be published in the *Journal of Agriculture* monthly until they are completed.

Selection of Locality.

Owing to the conditions which have for some time prevailed in this State, it is desirable that the prospective apple-grower should keep in view the fact that the future of the industry depends largely upon the *production of varieties suitable for export oversea.* He should also become acquainted with the conditions prevailing in the localities in which these varieties thrive best.

The locality chosen should be as near as possible to the city, so as to minimize the cost of production, haulage, and railway freights.

Any person, without previous knowledge of orchard work, going into the business should select his land, if possible, in an established fruit district, where he may be able to obtain skilled labour when required on his orchard. He would then, through intelligent application to his work, be in a position to master all the details of orcharding by the time his trees came into bearing.

Site for Orchard.

When it is decided that the locality for the orchard is to be in undulating country, the site should be selected with a gradual slope to the east or north-east, and, if not naturally protected by high lands or forest growth from northerly or westerly winds, breakwind hedges should be provided. Planting on steep abrupt slopes should be avoided, as heavy rains wash away the cultivated soil from the trees and increases the cost of cultivation.

The slopes lend themselves to drainage, and the blossoms of trees growing on them are less liable to be injured by late frosts than those growing on low-lying flat lands. Slightly elevated tablelands are preferable to low valleys for this reason, as the colder air, being heavier, descends and flows down the slopes, leaving the warm and lighter air encompassing the orchard site. In the past two seasons many fruit-growers whose orchards occupy low-lying valleys have suffered very considerably from late frosts, and, unless prepared to meet heavy expenses in taking remedial measures against them, such sites should be avoided.

Soils.

Throughout the State there are large tracts of country eminently suitable for the apple, but the deep sandy loams plentifully supplied with humus and overlying a permeable clay subsoil offer ideal conditions to the production of this particular kind of fruit. It is always to be remembered that the apple does not adapt itself to soils of a wet or sour nature, and, unless subdrainage is effectively carried out under such conditions, one cannot hope to be successful in the cultivation of the apple.

It is found by experience that the character of the soil plays a most important part, not only on the trees themselves, but also on the prolificacy and quality of the yield. Soils of granitic origin offer a genial home for the apple, where, under proper management, the trees are thrifty throughout a long series of years, yielding generous crops of fruit of excellent quality and colour. A remarkable feature of orchards established in soils of this character is the evident precocity of the trees, as it is not uncommon to gather considerable quantities of fruit three or four years after planting. Orchardists favored with this class of soil have no dread of the root-borer, which plays such sad havoc in many fruit-growing centres where the soil is suitable to its depredations, nor is the root-fungus (*Armillaria mellea*) much in evidence in soils of granitic origin.

Generally speaking, granitic soils are rich in potash, and this may account for the advantages in colour, quality, and production of orchards therein established.

Silurian soils are also much favoured by growers, and yield heavy crops of fruit of good

Plate 3.—Discing Orchard Land.

quality and colour. Generally, however, in such soils the subsoil is heavier and more tenacious than the former, and require to be thoroughly under-ground drained. The root-borer is often found in this class of soil, while being entirely absent in granitic country adjoining or not far distant.

Apple orchards give less satisfaction in the red soils of Gippsland, and these should be avoided for the more favorable ones previously mentioned.

The deep siltations of river valleys yield fruit incomparably more abundantly than anywhere else, but as the tree ages its size precludes it from the economical management necessary for the suppression of pests, the harvesting of the crop, and treatment whereby the quality of the fruit is maintained.

Plate 4.—Buck-scraper at Work.

The universal avoidance of basalt soils by growers throughout the State goes to show their estimation of this class of country for fruit-growing.

Climatic Conditions.

Consideration has been given to locality, site, and soil conditions, with suggestions as to how they may be made applicable to apple culture generally. However, we know that there are certain varieties which do not yield remunerative crops, no matter how perfect these conditions may be, if the climatic or atmospheric conditions do not prove congenial environments to the particular variety.

Under those adverse climatic conditions certain trees may grow to be large and healthy. They may carry a plentiful supply of apparently vigorous blooms, but the resultant fruit is usually small, sparse, and of inferior quality.

This is a phase of fruit-growing which a large percentage of those engaged in the industry have learned to their cost. Many thousands

of Munroe's Favorite, Cleopatra, Adams' Pearmain, and Nickajack trees have been grown to maturity, found wanting, and cut down in certain southern districts of Victoria owing to this cause, although they are mostly prolific bearers when cultivated north of the Dividing Range.

Preparation of the Land.

When the preliminary essentials—locality, site, soil, and climate—have received consideration, attention should be directed to the preparation of the land.

If it is decided to plant on virgin soil, which is mostly preferable, the land, if timbered, should be cleared, and all roots carefully removed to a depth of about 2 feet. This facilitates deep ploughing and subsoiling operations, and prevents the spread of the root-fungus (*Armillaria mellea*), which, if not treated, soon attacks the roots of the young fruit trees, becomes a menace to them, frequently causing their death in a remarkably short time. This fungus, being saprophytic, is capable of living on the dead roots of the forest timber until those of the young trees are reached.

Plate 5.—Slickers at Work.

The removal of the roots also reduces to a minimum the opportunity of the apple root-borer (*Leptops Hopei*) attacking the roots of the young trees. To eradicate this pest from the orchard area before planting operations commence, no suckers or undergrowths should be allowed to vegetate. They should be dug out and burned rather than ploughed under.

Clearing operations are more easily carried out during winter than at any other time, and when this work is completed in early spring the land should be ploughed and subsoiled, if possible.* The latter operation alters the original formation of the subsoil, assists drainage, which tends to aerate the soil, more moisture is retained during dry weather, thorough cultivation is facilitated, and finally trees planted on soil treated as described thrive better, come into bearing sooner, and produce more uniformly heavy crops of fruit than those cultivated under less congenial conditions.

* Except where the sub-soils are loose and offer free drainage.

Plate 1 shows the work of ploughing and subsoiling in progress. An ordinary single-furrow plough is used, and the sod may be from 8 to 10 inches, according to the depth of the surface soil. The subsoiler follows in the same furrow, breaking up the subsoil to a depth of from 8 to 10 inches, according to requirements. Care should be taken not to bring the subsoil to the surface during this operation.

Plate 2 gives a full view of the subsoiler, showing its construction and the arrangements for regulating the depth at which it may be worked, &c. In charge of a competent operator, this implement has proved highly satisfactory.

When ploughing and subsoiling operations are completed by September, the land should be allowed to remain in the rough until November, when it should be thoroughly worked with a disc cultivator. Plate 3 shows the class of implement used for this kind of work at the Leongatha Labour Colony. After discing the land it should be cross-ploughed and allowed to fallow during the summer.

As soon as weather conditions become favorable in the autumn, the orchard area should be again worked with the cultivator, or harrowed, to prepare it for grading, prior to being brought into a fit state of tilth to receive the young trees.

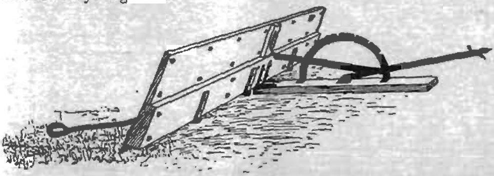

Plate 6.—Buck-scraper.

GRADING THE ORCHARD LAND.

When an orchard is being established in a northern irrigation district where, as a rule, the land has naturally a fairly even surface, the difficulties met with in grading and making it suitable for irrigation from channels are not so great as those which obtain in the southern and mostly undulating districts, where irrigation from dams is practised.

When serious inequalities in the orchard surface occur, and slightly elevated portions have to be carried away to fill up depressions, the scoop-shaped buck-scraper shown in Plate 4 has been found eminently suitable for the purpose.

Where depressions exist, and there are not sufficient elevations to fill them up, the surface soil could be removed from the headlands, or from situations where dams are to be constructed and used, for this purpose with advantage.

Where slight unevenness exists it may be fined down by the "Slicker," shown in Plate 5. This slicker has been used with satisfaction on the Central Research Farm, Werribee, where it is regarded as one of the most useful implements in grading the land and producing a fine

tilth. The slicker consists of three pieces of oregon 12 inches x 2 inches and 12 feet long, connected by two pieces of 6 inch x 6 inch hardwood, and drawn by four horses. The oregon is shod with 2 inch x $\frac{1}{4}$ inch steel on the front faces. Two pieces are inclined at an angle of 60 degrees to the horizontal, while the third piece is vertical, and acts as a fulcrum. The operator, by moving forwards or backwards while the implement is moving, can gradually "collect" or "pay out" the soil at will, and so remove inequalities of the surface.

Another design of a buck-scraper is shown in Plate 6, and recommended by Mr. Elwood Mead, when Chairman of the State Rivers and Water Supply Commission. The grading of land for lucerne culture in the Yakima Valley, in Washington, United States of America, is usually done by this implement.

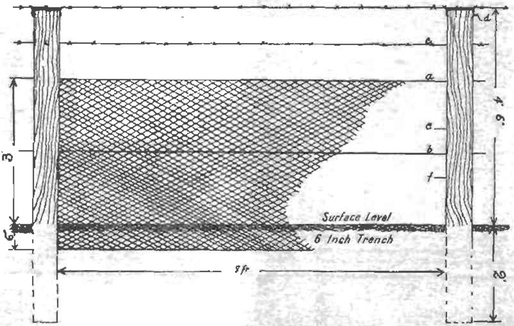

Plate 7.—The Orchard Fence.

Grading operations should be completed in June, so as to permit of the land being ploughed and harrowed before the young trees are planted. As early planting is desirable, this work should be done not later than the end of July, if possible.

Fencing the Orchard.

Rabbits and hares do considerable damage to young trees if permitted to enter the orchard, consequently a substantial rabbit-proof fence should be erected before the trees are planted.

Plate 7 shows the kind of fence recommended. The posts are 6 inches x 6 inches and 4 ft. 6 in. high, with 2 feet in the ground, and 8 feet apart.

Two No. 8 gauge ordinary fencing wires are put in at (a) and (b). These pass through $\frac{1}{2}$-in. holes in the post. The one marked (a) may be threaded through the $1\frac{1}{2}$-in. mesh wire netting, or the netting may be

fastened to it by wire clips. The netting represented by crossed diagonal lines is 3 ft. 6 in. wide, 6 inches of which is trenched in the ground with a turn towards the outside, so that when the rabbits scratch they will come in contact with the netting. Two barbed wires are used (c), drawn through holes in the posts and large enough to permit of passing through freely. The barbed wire on top is stretched along the posts and held in position by a piece of wire, which is passed through the post about 3 inches from the top, a few turns are taken around the barbed wire, as shown at (d). Should two wires be used instead of (b), they may be put in at (e) and (f), and for this purpose No. 10 gauge wire will suffice.

(*To be continued.*)

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Government Apiculturist.

XXVI.—THE HONEY FLORA OF VICTORIA—*continued.*

(Continued from page 249.)

The White Top Gum (*Eucalyptus vitrea*, R. T. Baker).

(Fig. 48.)

A tall tree with roughish bark similar to that of the Narrow-leaved Peppermint (*E. amygdalina*), the extremities of the branches being smooth. In the adult foliage the leaves are narrow, lance-shaped, about 6 inches long, of dull green, shining on both sides, stalk short, few veins and almost parallel to the midrib. The sucker leaves are alternate or opposite on a short stalk or stalkless, egg-lance-shaped pointed, under 6 inches long, and 1½ inches broad; the lateral veins diverge from below the middle of the midrib, and are prominent on both sides, with the marginal vein removed from the edge of the leaf.

The flower clusters are at the shoulders of leaves, and bear generally from five to eight flowers; buds with lid half-round, short pointed; fruit half-round.

The timber is moderately hard and close grained, full of shakes and gum veins and apparently of little value. This tree is also known as Silvertop Messmate, Peppermint, and Messmate. The term Silvertop refers to the silvery appearance of the tree in the sunlight, due to the reflection of the light from the surface of the shiny leaves causing them to appear silvery. The term White Top is no doubt used to distinguish it from the Peppermint (*E. amygdalina*) often known as Messmate. In Victoria the White Top Gum is found in the eastern parts of the State.

In regard to nectar production nothing distinctive is up to the present known, this tree being like many others known under various local names, and it is therefore inadvisable to allocate what information is available to any one particular species until it is identified on the spot.

Fig. 48.—The White Top Gum (*E. vitrea*, R. T. Baker).

THE GULLY GUM (*Eucalyptus Smithii*, R. T. Baker).

(Fig. 49.)

A ribbony barked tree of considerable size. It has smooth limbs, and most of the butt is smooth. It is closely allied to the Manna Gum (*E. viminalis*), quite identical with the latter in adult as well as in

sucker leaves, but while the flower buds of the Manna Gum always occur in threes (or less) the clusters in the case of the Gully Gum usually contain seven flowers, while the rough bark sometimes continues further up the stem than with the Manna Gum, of which it was formerly held to be a variety.

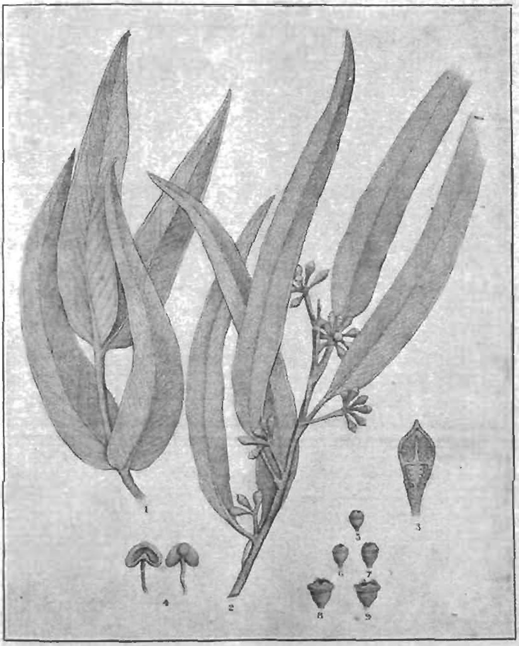

Fig. 49.—The Gully Gum (*E. Smithii*, R. T. Baker).

From R. T. Baker and H. G. Smith, Research on the Eucalypts, &c.

The timber is close grained, hard, and difficult to work. In Victoria the Gully Gum is found in Gippsland gullies.

The information available in regard to the nectar and pollen production of this species cannot at present be isolated from that concerning a number of other trees locally known as White Gums or Ribbon Gums.

THE WHITE BRITTLE GUM (*Eucalyptus maculosa*, R. T. Baker).

(Fig. 50.)

A tree also known as Spotted Gum and Brittle Gum, rarely exceeding 60 feet in height, usually from 20 to 40 feet. The bark is smooth right down to the ground. The sucker leaves are of thin texture, lance or oval lance-shaped, 2 or 3 inches long, opposite or alternate with the

Fig. 50.—The White Brittle Gum (*E. maculosa*, R. T. Baker).
From Proceedings, Linnean Society, N.S.W., 1899

marginal vein removed from the edge of the leaf. The adult leaves are lance-shaped or narrow lance-shaped, curved, not shining and of the same colour on both sides. The veins of the leaves are only faintly marked or rather obscure. Some trees have the leaves quite rigid and erect.

The clusters of from four to sixteen or even twenty flowers are at leaf shoulders, buds stalkless or on very short stalks, top-shaped, lid blunt and of equal length to the lower part of the bud. Fruit half-round to top-shaped with valve flaps projecting in ripe fruit.

The timber is straight grained and easy to work, but seasons badly, and is of little value on account of the presence of Gum veins.

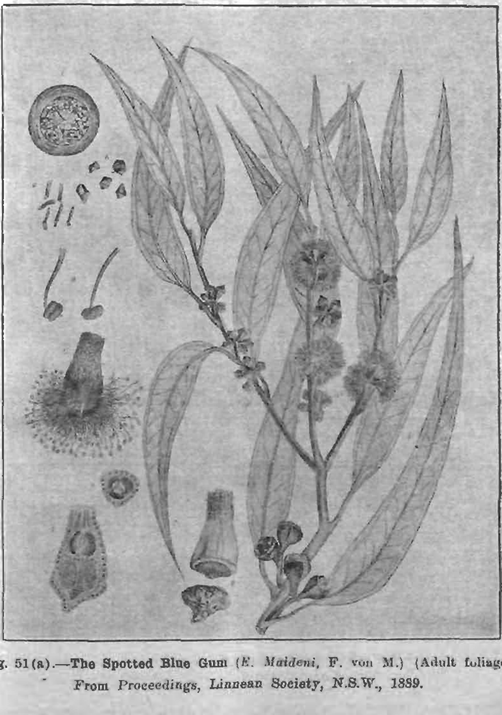

Fig. 51 (a).—The Spotted Blue Gum (*E. Maideni*, F. von M.) (Adult foliage).
From *Proceedings*, Linnean Society, N.S.W., 1889.

The White Brittle Gum grows in poor, open forest ground to a maximum height of 60 feet with a stem diameter of 1 to 3 feet, and a rather dense head. The bark is different shades of grey or bluish yellow with spots like those of the true Spotted Gum (E. *maculata*).

THE SPOTTED BLUE GUM (*Eucalyptus maideni*, F. v. M.).

(Fig. 51.)

A tree known as Blue Gum and Spotted Gum in different localities, and sometimes erroneously taken for the true Blue Gum (*E. globulus*). It is always a tall, straight-growing tree attaining a height of up to

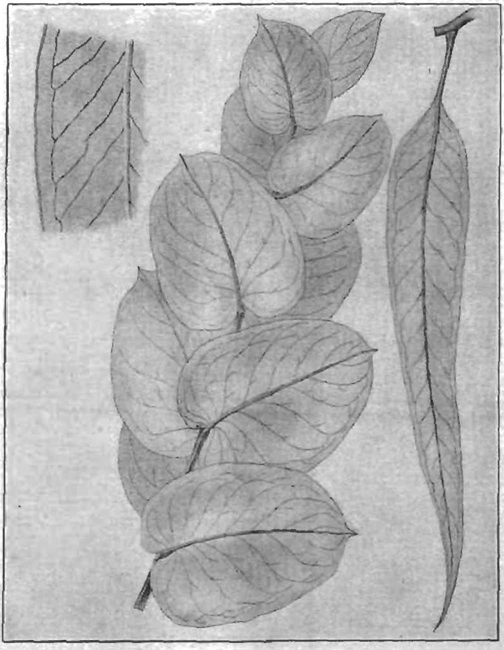

Fig. 51 (b).—The Spotted Blue Gum (*E. Maideni*, F. von M.) (Juvenile foliage). From Proceedings, Linnean Society, N.S.W., 1889.

150, or even 200, feet, with a diameter up to 4 feet with a smooth chalky white or bluish bark, hence its local name Blue Gum.

The sucker leaves are very large, *frosted or even chalky white*, round or heart-shaped, stalkless, and stem clasping on sharply angular branchlets. *In changing to the adult foliage the sucker leaves gradually become*

alternate and stalked, oblong and lance-shaped, often very narrow lance-shaped and more or less curved, attaining in the mature state a length of 12 inches or more, and resembling much the leaves of the Mountain Gum (*E. goniocalyx*), but not quite so lustrous on the upper side, the veins are distinct, the marginal one removed from the edge.

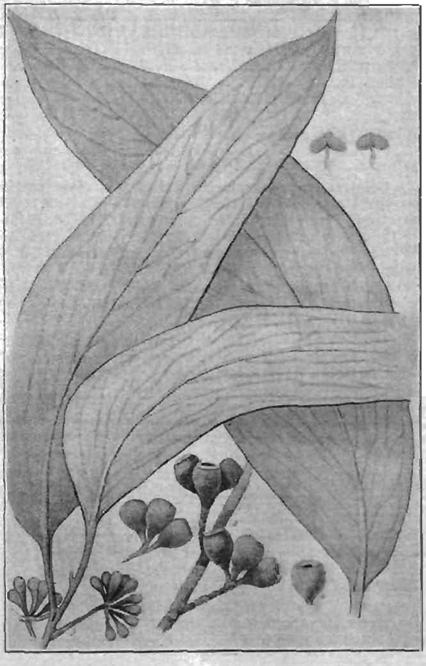

Fig. 52.—The Red Mountain Ash (*E. Delegatensis*, R. T. Baker).
From Proceedings, Linnean Society, N.S.W., 1900.

The flowers are few, stalkless, at the shoulders of leaves on a much flattened cluster stalk. The flow cup is angular or flattened, the lid of the bud much constricted and warty.

Fruit, ½ *inch in diameter, thus much smaller than that of the real* Blue Gum (*E. globulus*) top shaped to somewhat half-round.

The Spotted Blue Gum in general appearance resembles the Blue Gum (*E. globulus*) and the Mountain Gum (*E. goniocalyx*). From the latter, with which it grows in company on the mountain slopes, it is often not readily distinguished, trunks and foliage of the two trees having much the same appearance. They differ, however, in their fruits and sucker leaves, so that there is little difficulty in distinguishing them. They also differ in their timber, while that of the Mountain Gum (*E. goniocalyx*) is of a dirty brown colour that of the Spotted Blue Gum is of a yellow tint. Though not much used, except occasionally for wheelwright's work, it is nevertheless a good durable timber.

No distinct information is yet available as to the value of this species to honey producers and its habits and time of flowering.

THE RED MOUNTAIN ASH (*Eucalyptus Delegatensis*).

(Fig. 52.)

A very tall tree occurring on the top of mountain ranges. The bark is stringy and reddish extending well up the trunk. The leaves are comparatively large, often 9 inches long and 2 broad, pointed lance-shaped, with the veins prominent, the marginal vein removed from the edge. Sucker leaves broad, lance-shaped unevensided with prominent veins.

Flowers six to ten in a cluster on a stalk about 6 inches long at shoulders of leaves; buds with short tube and half-round blunt lid. Fruit pear-shaped with thick rim.

Judged by specimens of leaves and buds this tree is difficult to differentiate from the Silver Top (*E. Sieberiana*), sucker leaves also are very similar, but bark and timber of the two are quite different.

Found in Victoria on mountain ranges in the eastern part.

(To be continued).

THE importance of fineness of subdivision to the utility of crusted limestone for soil amendment is shown from the results of experiments conducted at the Pennsylvania Experiment Station, and reported by Walter Thomas and William Frear, in June, 1915.

The crop grown was clover, and separate plots were treated with crusted limestone of various known degrees of fineness. After eight and a half months the crop was harvested, air dried, and weighed.

The figures show (1) the need of the soil for amendment to fit it for clover production; (2) that the fineness of limestone greatly affects its value as an amendment for many months after its application, even to a highly acid soil—the finer the limestone the better the crop, *i.e.*, up to the limits of fineness tested, which was finer that one-hundredth of an inch.

It is given that compact limestone of high purity should be crusted to a fineness of not less than one-sixtieth of an inch, to fit it for economical use as a soil amendment.

THE NEW ALCOHOL TABLES.

From 1st January next the old tables which have been used for many years past in conjunction with Sikes Hydrometer for the determination of alcohol strengths throughout the Empire will be superseded by new tables, known as Thorpe's, recently compiled for and adopted by the Imperial Government.

Though the change will not be of a revolutionary nature, seeing that the maximum divergence between the old tables and the new is in the neighbourhood of 1 per cent. of proof-spirit, it is desirable that wine-makers and all interested in questions of spirit strengths should prepare for the adoption of the new tables, which will come into force on New Year's Day next. Curiously enough, it is at 30 per cent. of proof-spirit, a strength of considerable importance to the wine trade, that the greatest difference between the old and new tables occurs. Thirty per cent. proof marks the dividing line between the 1s. 3d. per gallon and the 3s. per gallon duties for admission of wine into the United Kingdom. The change will mean that a wine now considered to be of a strength of 29.5 per cent. proof, and therefore dutiable at 1s. 3d. per gallon, will, after the 1st January next, according to the new, or Thorpe's Tables, be held to contain 30.5 per cent. of proof-spirit and will have to pay the higher duty of 3s. per gallon. The change will also affect contract sales where it is stipulated that the wine should be of a given alcoholic strength.

The report of the Commonwealth Analyst dealing with the subject, a copy of which has been recently received from the Acting Prime Minister, and which is here reproduced, will no doubt be read with interest by Victorian vine-growers. Several other points are also dealt with; the report recalls, for instance, the old-time controversy concerning the maximum strength of a natural wine, which gave rise to so much discussion in the late seventies of last century.

The investigations as to the strengths of Australian wines shipped to London are also most interesting. The discrepancy between the determinations of alcohol strengths in Melbourne and in London (*see* Table I.) constitute a curious point, and one concerning which further information will be awaited with interest.

François de Castella,
Government Viticulturist.

Alcoholic Strength of Australian Wines.

Report submitted by W. Percy Wilkinson, Commonwealth Analyst.

The Comptroller-General of Customs.

The revised tables adopted by the British Government for the calculation of the proof-strength of wines and spirits are legalized by Section 19 of the Finance (No. 2) Act of 1915.

2. The revised tables were compiled in the Government Laboratory, London, under the direction of Sir Edward Thorpe, late Principal of the Government Laboratory, by Mr. T. J. Cheater and Mr. John Holmes

3. During my visit to London in 1912 the Principal of the Government Laboratory, Sir James Dobbie, informed me of the progress made in the computation of the revised alcohol tables, and subsequently Mr. Cheater and Mr. Holmes afforded me detailed information of the procedure followed in the numerous recalculations, carried out with extraordinary accuracy, involved in the preparation of the new tables from the original alcoholometric investigations of Sir Charles Blagden, Gilpin, Drinkwater, and Mendeléeff.

4. The change to the new tables will materially affect the incidence of the wine duty, which is fixed in Great Britain at the limit of 30 per cent. proof-spirit, as the dividing line between the higher and lower rates of duty.

5. The 30 per cent. proof-spirit dividing line between the higher and lower rates of duty was adopted by the British Government on the recommendation contained in the report of the Select Committee of the House of Commons on the wine duties presented to Parliament in 1879. The Committee, in its report, mentioned that the dividing line which then obtained of 26 per cent. proof-spirit between the higher and lower rates of duty on wines had been fixed "to facilitate the consumption of genuine wine, under provisions insuring the necessary safeguard against importation of spirit in the guise of wine, to the detriment of the duty on spirits. With that view, 26 per cent. was fixed as the limit of the alcoholic strength of wines called natural." Evidence was given before the Committee contending that Australian wines were naturally of a higher strength than 26 per cent. proof-spirit. The principal witnesses were Sir H. Blyth, Agent-General for South Australia; Mr. P. B. Burgoyne; Sir H. Barclay, sometime Governor of Cape Colony; and others. Adverse evidence was given by Mr. A. Lalande, President of the Chamber of Commerce, Bordeaux, and by Mr. W. H. Burston, South Australia, in a letter addressed to the Chairman of the Committee.

6. The Select Committee concluded its report by recommending that the standard of strength of wines be raised so as to admit of Australian wines entering at the lower rate.

7. The British Government, acting on the recommendation of the Select Committee of 1879, raised the degree of strength at which wines were admitted at the lower rate from 26 per cent. up to 30 per cent., and it has stood at the latter figure ever since.

8. During the past two years a number of samples, representative of bulk shipments of Australian wine to London, have been tested in the Commonwealth Laboratory. The samples are averages, and representative of shipments comprising at least 1,475 hhds. and quarter-casks, the contents of which were approximately 69,000 gallons. The same casks from which the samples were drawn in Australia prior to shipment were also sampled by the Officers of Customs and Excise after arrival at the London docks, and tested in the Government Laboratory, London, under arrangement agreed to by the Board of Customs and Excise.

9 The tests of these Australian wine imports conducted in the Government Laboratory, London, are, in general, in good agreement with the tests of samples drawn from the same casks in Australia prior to shipment. (*See* Table I., appended hereto.) The differences observed are, in the majority of instances, lower readings for strength to the extent of about 0.5 per cent. In five cases only has an increase in strength been recorded in London; in four of these the difference falls

within the limit of experimental error. The remaining instance showed a gain in strength of 1.2 per cent. proof-spirit. This, however, has not been due to secondary fermentation during the voyage to London, as the wine, prior to shipment, was proved to contain no fermentable sugar.

10. In Table II., appended, details are tabulated of the tests made in the Commonwealth Laboratory of these shipments of Australian wine, and the strength, as ascertained by Hehner's tables, and also by the new tables, are recorded for comparison. It will be observed that the strength of the bulk shipments of wines exported during the past two years, when calculated by the new tables, ranges from a minimum of 23.3 per cent. up to a maximum of 28.7 per cent. By the Hehner tables, the strength found was uniformly 0.5 per cent. higher. It is generally known, however, that Hehner's tables give higher values than the official Sikes tables to the extent of about 1 per cent. This was commented upon by Sir James Dobbie.

11. It is desirable that the fact should be emphasized strongly that the bulk exports of Australian wines represent blends on a very large scale of wines of similar character and type, though often of different vintages. The alcoholic strength of the wines entering into a blend is therefore normally subject to some variation, the strength of the blend being proportionate to those of the wines entering into the blend.

12. It has not yet been proved that the earlier statements as to the alcoholic strength of Australian wines, though exceptionally only, rising to as much as 30 per cent. of proof-spirit, or even exceeding that figure, are not correct. Investigations into this matter have been in progress in the Commonwealth Laboratory for some time, and are not yet completed.

13. The incidence of the British new tables for ascertaining the strength of spirits and wines becomes, therefore, a matter of importance to the Australian wine industry. In Table III., appended hereto, the special incidence of the new tables, as compared with the Sikes tables, is shown for the degrees Sikes ranging from 89.0 degrees to 92.0 degrees; it is at the higher degrees of Sikes, viz., those in the neighbourhood of 30 per cent. proof-spirit, that the naturally strong Australian wines may occasionally be at a disadvantage on importation to Great Britain, for the alcoholic strength by the old tables of a wine formerly permitted importation under the lower rate of duty at 29.5 per cent. proof-spirit would, under the new tables, be assessed at 30.5 per cent. proof-spirit at the higher rate of duty.

14. Bearing in mind that the samples representing bulk wine exported to London, tested in the Commonwealth Laboratory during the past two years, have been blends of wines varying to some extent in their natural alcoholic strength, it must be conceded that there is a possibility, when unblended Australian wines of the maximum strength are exported to Great Britain, that they may be charged at the higher rate of duty, for the new tables, in the critical neighbourhood of 29 to 30 per cent. proof-spirit, read approximately 1 per cent. higher than the old official tables.

15. In view of the above facts, and also as a means of providing against the common sources of experimental error in the sampling of bulk wines and in the analytical testing for alcoholic strength, it is recommended that representations be made to the Under-Secretary of

TABLE I.

Exporter.	Cask Mark.	Shipped by.	Consigned to.	Melbourne Date of Test.	Alcoholic Strength.		
					Com. Lab.	Govt. Lab., London.	Difference.
E. Collins	2	s.s. *Commonwealth*	W. and A. Gilbey ..	23.7.1914	25·2%	25·2%	0·0%
P. B. Burgoyne and Co., 6,106 g. ..	212 } 100 hhds. ..	s.s. *Marathon* ..	P. B. Burgoyne Ltd.	21.7.1914	26·4%	26·2%	− 0·2%
	287 }	,,	,, ,,	,,	26·6%	26·2%	− 0·4%
P. B. Burgoyne and Co., 6,637 g. ..	2205 } 200 qr. casks ..	s.s. *Commonwealth*	,, ,,	29.7.1914	25·8%	25·1%	− 0·7%
	2321 }	,,	,, ,,	,,	25·4%	25·1%	− 0·3%
P. B. Burgoyne and Co., 6,686 g. ..	1999 } 200 qr. casks ..	s.s. *Ballarat* ..	,, ,,	20.6.1914	25·3%	25·1%	− 0·2%
	2145 }	,, ..	,, ,,	,,	25.8%	25.4%	− 0·4%
P. B. Burgoyne and Co., 6,448 g. ..	2584 } 100 hhds. ..	s.s. *Persic* ..	,, ,,	25.5.1915	29·2%	27·0%	− 2·2%
	2644 }	,, ..	,, ,,	,,	29·0%	27·1%	− 1·9%
P. B. Burgoyne and Co., 10,268 g. ..	3005 } 160 hhds. ..	s.s. *Poona* ..	,, ,,	3.8.1915	26·3%	26.6%	+ 0·3%
	3051 }	,, ..	,, ,,	,,	25·8%	26·3%	+ 0.5%
P. B. Burgoyne and Co., 3,440 g. ..	3208 } 100 qr. casks ..	,, ..	,, ,,	,,	27·7%	27·3%	− 0.4%
P. B. Burgoyne and Co., 12,509 g. ..	3431 } 200 hhds. ..	s.s. *Malakuta* ..	,, ,,	18.9.1915	28·7%	28·6%	− 0·1%
P. B. Burgoyne and Co., 4,007 g. ..	3635 } 120 qr. casks ..	,, ..	,, ,,	,,	26·1%	25·6%	− 0·5%
P. B. Burgoyne and Co., 3,235 g. ..	3230 } 50 hhds. ..	s.s. *Cooee* ..	,, ,,	12.8.1915	27·7%	28·1%	+ 0·4%
3,342 g. ..	3340 } 100 qr. casks ..	,, ..	,, ,,	,,	26·3%	27·5%	+ 1·2%
P. B. Burgoyne and Co. 3,399 g. ..	3870 } 100 qr. casks ..	,, ..	,, ,,	,,	25·1%	25·2%	+ 0·1%
	3936 }	,, ..	,, ,,	,,	25·6%	25·3%	− 0·3%
P. B. Burgoyne and Co. 2,818 g. ..	3960 } 45 hhds. ..	s.s. *Khyber* ..	,, ,,	21.10.1915	23·8%	23·1%	− 0·7%
	3990 }	,, ..	,, ,,	,,	23·8%	24·5%	+ 0·7%

Table II.

Cask No.	Com. Lab. Test, calculated by Hehner's Tables.	Com. Lab. Test, calculated by Thorpe's Tables.	Reduction by New Tables.
2	25·2%	24·8%	– 0.4%
212	26·4%	25·9%	– 0·5%
287	26·6%	26·1%	– 0·5%
2205	25·8%	25·3%	– 0·5%
2321	25·4%	24·9%	– 0·5%
1999	25·3%	24·8%	– 0·5%
2145	25·8%	25·3%	– 0·5%
2584	29·2%	28·7%	– 0·5%
2644	29·0%	28·5%	– 0·5%
3005	26·3%	25·8%	– 0·5%
3051	25·8%	25·3%	– 0·5%
3208	27·7%	27·2%	– 0·5%
3431	28·7%	28·2%	– 0·5%
3635	26·1%	25·6%	– 0·5%
3230	27·7%	27·2%	– 0·5%
3340	26·3%	25·8%	– 0·5%
3870	25·1%	24·7%	– 0·4%
3936	25·6%	25·1%	– 0·5%
3960	23·8%	23·3%	– 0·5%
3990	23·8%	23·3%	– 0·5%

Table III.

Table showing Incidence on Wine Duties of Thorpe's New Tables on Alcohol.

Sikes.	Old Tables.	Proof-spirit Percentage.	New Tables.	Proof-spirit Percentage.	Increase in Percentage Proof-spirit, due to New Tables.
	Under-proof.				
%	%	%	%	%	%
89·0	69·4	30·6	68·4	31·6	+ 1·0
89·2	70·1	29·9	69·1	30·9	+ 1·0
89·4	70·8	29·2	69·8	30·2	+ 1·0
89·6	71·4	28·6	70·5	29·5	+ 0·9
89·8	72·1	27·9	71·2	28·8	+ 0·9
90·0	72·8	27·2	71·9	28·1	+ 0·9
90·2	73·5	26·5	72·5	27·5	+ 1·0
90·4	74·1	25.9	73·1	26·9	+ 1·0
90·6	74·8	25·2	73·8	26·2	+ 1·0
90·8	75·4	24·6	74·5	25·5	+ 0·9
91·0	76·1	23·9	75·2	24·8	+ 0·9
92·0	79·2	20·8	78·4	21·6	+ 0 8

State, Colonial Office, to move the Commissioners of Customs and Excise, with the object of securing, in the administrative practice of their Department, a working tolerance or margin of safety of 0.5 per cent. on the limiting strength of 30 per cent. in favour of all wines imported in cask, and known to the trade as "dry" wines. These completely fermented and natural "dry" wines are the only types of bulk wines exported from Australia to the Mother Country.*

16. As this matter is one of great importance to the Governments of the States of New South Wales, Victoria, South Australia, and Western Australia, it is recommended that a copy of this report should be furnished to those Governments.

* Whilst the above was in press the Acting Prime Minister was advised by the High Commissioner that the Lords Commissioners of the British Treasury are unable to agree to this suggestion, for the reason that it would not be practicable to give special treatment to Australian wines in the matter. They point out that the postponement of the operation of the new tables, as regards wines, until 1st January, 1917, should enable any necessary alteration in the strength of the wine to be made before importation into the United Kingdom.

INCREASING THE MILK YIELD.

The *Farmer and Stockbreeder* says:—"At the present time there is a strong demand that farmers should do their utmost to increase the production of food. It is interesting, therefore, to see what can be done in the way of producing more milk and butter. The first point we should remember in this connexion is, that the greater the milk yield of our cows, the cheaper will the milk be produced per gallon. We can do very little by feeding. If we have a splendid cow we can feed her so that she will do her best; if we have a poor cow we can do the same. But no amount of food will make a poor cow give a good yield. If we try to force her she may give a little more milk, but the extra milk will probably not pay for the extra food required. We might be able to increase the number of cows giving milk, and each must think that out for himself. The recognised way of increasing the milk yield of a herd is by selective breeding, but that is a process which requires years of careful attention to achieve a measurable improvement. By employing bulls of a good milking strain and mating them with selected cows which have given good yields of milk, something can be done. The importance of weighing the milk from each cow and regularly recording it should be recognized. It is in times of stress usually that the greatest progress is made. The progress made in Sweden by the work of the milk recording societies is shown in the following calculated annual yields per cow:—1870, 2,600 lbs.; 1880, 3,700 lbs.; 1903, 4,200 lbs.; 1913, 4,730 lbs. The champion American Holstein-Friesian cow, Tilly Alcatra, gave 30,451 lbs. of milk, so there is plenty of room for improvement in the average cow still."

RICE CULTIVATION, KOYUGA.

By Temple A. J. Smith, Chief Field Officer.

Mr. Montague Shan, who resides on an area 3 miles from the Koyuga railway station, has lately been experimenting with rice cultivation. The land on which the rice is growing is partly red land and partly low-lying black land, and was cultivated before sowing much as wheat land is prepared. The land was watered before seeding, and the seed drilled in in rows 14 inches apart at a depth of 1 inch, the quantity of seed sown being 30 lbs. per acre. The date of sowing the 26th November, 1915—the variety being that known as "Takasuka."

Water was applied once a week from the time of seeding until a week before harvesting, which operation was in progress at the time of my visit (1st June). Superphosphate at the rate of 120 lbs. per acre was applied.

The crop, when ripe, was 2 ft. 6 in. in height, and very uniform, but had ripened unevenly, some of the heads and stalks being green, while others appeared fully matured. Patches of the crop had not filled well, which will have a bad effect on the yield as a whole.

The stooling capacity of rice is very great, from 30 to 40 stalks growing from one seed. No sign of disease was noticeable in the crop. A portion had been harvested with a stripper-harvester, yielding at the rate of seven bags per acre of rice with the hull on, which, when hulled, would leave 60 per cent. of marketable rice, viz., 756 lbs. per acre.

This system of harvesting was wasteful, in that the harvester was not a suitable machine for the purpose, leaving some of the rice on the stalks, and shelling a portion on the ground. The straw also was left on the ground, and as this is useful for stock-feeding, thatching, &c., such a system of harvesting is not desirable.

Mr. Shan has had constructed a special dam which is filled from the channels, and in which applications of water can be made when water is not available from the usual sources. This is highly necessary, as the land on which the rice is growing must not be allowed to dry out, but must be kept moist at all times. The amount of water per acre used in this experiment was 5 acre-feet, and Mr. Shan makes the suggestion that rice could be grown in seasons when water is plentiful, and fodder crops in dry years when they have a higher market value. He is of opinion that rice-growing would utilize low-lying land that at present is too wet for the successful cropping of wheat and other cereals. There is a considerable area of such land along the Murray River and in various other parts of the State.

Mr. Shan gives the following estimate of the cost of growing rice:—

	£	s.	d.
Rent of land	0	10	0
Interest on cost of grading	0	10	0
Water charges	1	5	0
Seed and labour	1	15	0
Cultivation, manures, harvesting, &c.	1	10	0
	£5	10	0

756 lbs. at 2d. per lb. would return £6 6s. per acre—leaving a balance of 16s. per acre. The average return from rice is approximately

1,600 lbs., which, at the wholesale price of 2d., would give £13 6s. 8d. per acre.

As might be anticipated, Mr. Shan's first experiment has shown that very material improvement in methods of cultivation can be made. The crop in the first place was much too thick, and instead of sowing 30 lbs. per acre, 20 lbs. would probably be quite sufficient, and lead to better filled heads. Cutting the crop with a reaper and binder and threshing later is the practice adopted on the rice fields of America, and this would probably be advisable here.

It is unlikely that the most suitable variety has been found, at the first attempt, to give the best possible results, and further improvement is probable in the direction of the introduction of a rice seed yielding better than that already grown.

Earlier seeding, say about the middle of October, would give the crop a better opportunity of maturing grain to advantage.

Mr. Shan is to be congratulated upon the success of his first venture in rice-growing. He has proved that the crop can be grown under local conditions on land that for other purposes is of little value. He is so satisfied with the prospect that he intends sowing 60 acres in the coming season. Other farmers in the district are sowing small areas, and are obtaining the seed from Mr. Shan at 1s. per lb.

The main essentials for success in rice-growing appear to be a soil capable of holding moisture beyond the average.

Perfect grading at an almost dead level.

A thorough command of water as required.

The right kind of machinery for handling the crop.

The use of specially suited varieties.

The land should be fallowed in autumn, and a good seed-bed prepared in the spring.

The soil should never be allowed to dry out after the seed is planted, until harvest time.

A good system of drainage so that the water can be taken off when required.

The crop, after harvesting, should be well dried out before threshing, to save cracking the grain.

INSECT PESTS OF THE FRUIT, FLOWER, AND VEGETABLE GARDEN.

AND HOW TO TREAT THEM.

By C. French, Jnr., Government Entomologist.

(Continued from page 438.)

The Dark-Purple Wattle Scale.

(Mealy Bug.)

Unfortunately, growers of wattles have another native pest to contend with, namely, the dark-purple wattle scale (mealy bug). This formidable insect was first discovered on the so-called cape wattle, but it now attacks all kinds of wattles planted in gardens and plantations. In general appearance it is black and white, but upon closer examination it may be seen that it is of a dark-plum colour, almost black, with a white margin, the female being covered with a cottony secretion. The larvæ are singular-looking insects; at certain seasons of the year they simply swam over the affected trees, and from thence are easily distributed by means of plants, and possibly, by birds carrying them on their feet from tree to tree. When a tree is badly affected, the branches become black and dirty looking, and if the pests are left unchecked they will soon kill the tree right out. This pest is now spreading to orange trees, so growers should be on the lookout, as it is certainly a most destructive species. Many remedies have been tried, and good results have been obtained by using the kerosene emulsion on large trees, and the red oil in places where there are only one or two small trees.

Fig. 16.—The Dark-Purple Wattle Scale
(*Pseudococcus albizziæ*, Maskell).

Spraying with the red oil should be done in summer or autumn. Several brands of this oil are on the market, the price of same being within the reach of all.

Whilst on the topic of mealy bugs, I might be permitted to mention a pest very destructive to carnation plants, viz., the common mealy bug. This insect is often very prevalent, and causes growers much concern by living on the roots of carnations. Recent experiments with the manurial insecticide and fumus have given excellent results. These preparations are sprinkled on the soil and then dug into the ground. They are deadly to all kinds of insect life, &c., such as millipedes, wire-worms, slaters.

THE BEAN BUTTERFLY.

This is a very common, small, blue butterfly, the larva of which causes growers of French and broad beans much annoyance. The eggs of the butterfly are deposited on the beans, and as soon as the young caterpillars are hatched they commence at once to bore into the pods, and soon eat the young beans; the pods then become yellow, and shrivel up. The larva of this insect is greenish, and in shape is not unlike the woodlouse (Slater). During the last couple of months, these butterflies have been very numerous in vegetable gardens in the suburbs, and growers of beans have had to wage continual warfare against them. Immediately the beans show signs of shape, and if the butterfly season be at hand, spray the rows with arsenate of lead, this preparation, on account of its weak strength, being particularly harmless to human beings. These insects have many natural enemies, especially amongst our insectivorous birds, such as "fly-catchers," robins, wrens, tomtits, &c., all of which destroy vast numbers of the perfect insects annually.

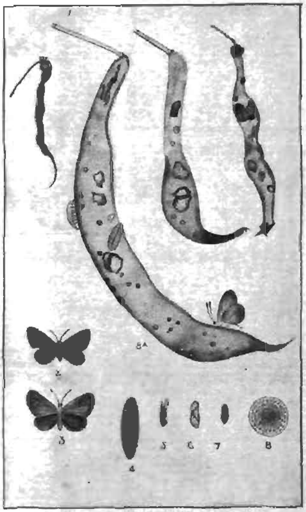

Fig. 17.—The Bean Butterfly
(Zizera labradus, Godt).

THE PUMPKIN BEETLE.

This is a handsome little insect, about ¼ inch long by ⅛ inch broad, not unlike some of the ladybird beetles. In colour it is a distinct orange-yellow, with a blackish patch in the shoulder of each wing-case, with

a corresponding but more rounded blackish spot towards the tips of the wing-cases. The eggs, which are placed on leaves, stems, &c., are irregularly oval in form, and finely granulated with an irregular network pattern. Although they are only about as big as a pin's head, they are still easily seen with the naked eye. They take about a week

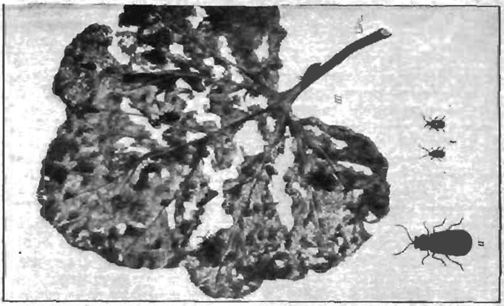

Fig. 18.—The Pumpkin Beetle (*Aulacophora hilaris*, Bois).

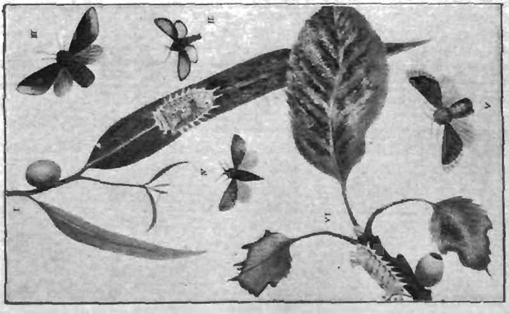

Fig. 19.—Mottled Cup Moths (*Doratifera vulnerans*, Lewin).

to hatch out. As a rule, the depredations of this beetle have mostly been confined to plants belonging to the melon, pumpkin, and marrow family; but, unfortunately, it has also started to attack peaches, nectarines, cherries, young apples, &c., and in some districts causes considerable losses. The following sprays have been tried with splendid

results:—Arsenate of lead, hellebore, Paris green, and kerosene emulsion. Another remedy has been tried with good results, viz., 1 part of kerosene oil, 1 part of sour milk, and 100 parts of water. The crude oil of tar, which is used generally for veterinary purposes, and costs about 2s. per gallon, can be used. One gallon makes 80 gallons of spray. When the pumpkin beetles were very plentiful in 1913, this spray was used with good results. Dusting the plants with air-slaked lime has also proved effectual.

Mottled Cup Moths.

The common name of the cup moth has been adopted on account of the singular woody and cup-shaped cocoon of the insect. The larvæ of this moth are peculiar creatures, being flat and soft on the under side, and raised saddle-like on the upper side, the upper part being covered with clusters of spines. These spines can be withdrawn at the pleasure of the insect, and when handled by the incautious they produce a sharp stinging sensation, and on this account the larvæ have earned for themselves the name of "stingers." This insect is usually found feeding on the leaves of the eucalypts, and at the present time are exceedingly numerous in and near the Dandenong and other Ranges, on the leaves of the peppermint and other eucalypts. The larvæ eat the epidermis from the leaves, and in some localities many trees look as if a fire had scorched them. Like many of the other native insects, it has taken to fruit trees, principally apples and cherries. They are voracious feeders, and sometimes nine or ten larvæ are found upon one leaf. The caterpillars of this moth have a very persistent enemy in one of the large Ichneumon wasps, which deposits its eggs on the grub before it begins to spin its cocoon; and when the wasp is fully grown it gnaws a circular hole through the side of this prison, as, unlike the moth, it is unable to push the lid off. Arsenical sprays, Paris green, or arsenate of lead will deal effectively with this pest when on fruit trees. The caterpillars of this moth were killed in great numbers a year or so ago near Melbourne by means of a bacterial disease. Owing to their spines, the caterpillars of the cup moths are left severely alone by insect-eating birds.

(To be continued.)

VEGETABLE PAINT.

In certain parts of Uruguay, the farm buildings are a fine white colour, even during the wet season. To obtain this neat effect, a whitewash is used, made from the sliced "leaves" of the Prickly Pear, which when macerated in water for twenty-four hours, produce a solution of creamy consistence. To this lime is added and well mixed in. When the solution is applied to any surface, be it wood, brick, iron, or other material, a beautiful pearly white appearance is produced, which endures through rains and frosts for many years.—The *Tropical Agriculturist*, February, 1916.

VERNACULAR NAMES OF VICTORIAN PLANTS.

Communicated by Alfred J. Ewart, D.Sc. Ph.D., Chairman, and C. S. Sutton, M.B. Ch.B., Secretary of the Plant Names Committee of the Field Naturalists' Club of Victoria.

Continued from page 243, Vol. xiv. (10th April, 1916).

Botanical Name.	Popular Name.	Use or Character.
SYMPETALEÆ HYPOGYNÆ—*continued.*		
LABIATÆ.		
Plectranthus—		
*parviflorus, Henckel. ..	*Cockspur flower*	*Especially worthy of garden culture.*
Mentha—		
laxiflora, Benth. ..	Forest Mint	May possibly afford a source of oil or perfume, or be of use as culinary herbs.
australis, R.Br.	River Mint	
gracilis, R.Br.	Slender Mint	
saturejoides, R.Br. ..	Creeping Mint	
Lycopus—		
europaeus, L. (L. australis, R.Br.)	Gipsywort	Yields a black dye, used by gypsies.
Salvia—		
plebeja, R.Br.	Austral Sage	Of no known economic value.
Prunella—		
vulgaris, A.DC.	Selfheal	Formerly used as a medicinal herb.
Scuttellaria—		
molis, R.Br.	Soft Skullcap	Of no known economic value.
humilis, R.Br.	Dwarf Skullcap ..	
Prostanthera—		
lasianthos, Labill. ..	Christmas Bush ..	All the species of this genus are more or less worthy of garden culture, and more especially P. melissifolia, P. lasianthos, P. rotundifolia, P. denticulata, or the red-flowered P. microphylla, and P. aspalathoides.
melissifolia, F.v.M. ..	Balm Mint Bush ..	
incisa, R.Br.	Cut-leaved Mint Bush ..	
rotundifolia, R.Br. ..	Round-leaved Mint Bush	
violacea, R.Br.	Violet Mint Bush ..	
hirtula, F.v.M.	Hairy Mint Bush ..	
denticulata, R.Br. ..	Rough Mint Bush ..	
spinosa, F.v.M.	Spiny Mint Bush ..	
cuneata, Benth. ..	Alpine Mint Bush ..	
phylicifolia, F.v.M. ..	Spiked Mint Bush ..	
decussata, F.v.M. ..	Dense Mint Bush ..	
Behriana, Schlech. ..	Grey Mint Bush ..	
nivea, Cunn.	Snowy Mint Bush ..	
saxicola, R.Br.	Rock Mint Bush ..	
debilis, F.v.M.	Slender Mint Bush ..	
Walteri, F.v.M. ..	Mountain Mint Bush ..	
microphylla, A. Cunn. ..	Small-leaved Mint Bush ..	
aspalathoides, A. Cunn. ..	Scarlet Mint Bush ..	
chlorantha, F.v.M. ..	Green Mint Bush ..	

*Plants marked thus are listed either as growing plants or as seeds by one or more of our florists.

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

SYMPETALEÆ HYPOGYNÆ—*continued.*

Botanical Name.	Popular Name.	Use or Character.
LABIATÆ—*continued.*		
Westringia—		
rosmariniformis, Smith	Rosemary Westringia	Most of the species of this genus are worthy of garden culture, and more particularly W. rosmariniformis and W. glabra.
rigida, R.Br.	Stiff Westringia	
senifolia, F.v.M.	Alpine Westringia	
eremicola, A. Cunn.	Slender Westringia	
glabra R.Br.	Violet Westringia	
Ajuga—		
australis, R.Br.	Bugle	Worthy of garden culture, but apt to become a weed in moist pastures.
Teucrium—		
sessiliflorum, Bth.	Scented Germander	Might be improved by garden cultivation.
corymbosum, R.Br	Forest Germander	
racemosum, R.Br.	Grey Germander	
VERBENACEÆ.		
Verbena—		
officinalis, L.	Common Vervein	Formerly used as a medicinal herb.
Chloanthes—		
parviflora, Walpers.	Small-flowered Chloanthes	No known economic value.
Avicennia—		
officinalis, L.	White Mangrove	Useful as a fixing agent on marine mud flats and inlets.
MYOPORACEÆ.		
Eremophila—		
oppositifolia, R.Br.	Twin-leaved Emubush	The bruised leaves of this plant are used by the aborigines for tanning wallaby and other skins.
longifolia, F.v.M.	Berrigan	Of the Eremophilas, the following are especially worthy of garden cultivation, E. bignoniflora, E. maculata, E. gibbosifolia, E. divaricata; but E. maculata is a supposed poison plant, and appears to be most dangerous when in fruit.
polyclada, F.v.M.	Branching Emubush	
bignoniflora, F.v.M.	Bignonia Emubush	
Brownii, F.v.M.	Dwarf Emubush	
maculata, F.v.M.	Spotted Emubush	
alternifolia, R.Br.	Tufted Emubush	
scorparia, F.v.M.	Silvery Emubush	
gibbosifolia, F.v.M.	Scaly Emubush	
divaricata, F.v.M.	Spreading Emubush	
Myoporum—		
tenuifolium, G. Forst.	Thin-leaved Myoporum	Not injurious, but of no special economic value.
Dampieri, Cunn.	Waterbush	
deserti, Cunn.	Turkeybush	Suspected as a poison plant when in fruit.
insulare, R.Br.	Coast Boobialla	Useful for hedges and wind-breaks in coastal districts.
viscosum, R.Br.	Sticky Boobialla	Of no special economic value.
humile, R.Br.	Creeping Myoporum	Useful in rockeries and on the sides of railway cuttings, &c.
platycarpum, R.Br.	Sugar Wood	This wood has a fine grain, is beautifully mottled, and is suitable for veneering &c.
floribundum, Cunn.	Many-flowered Myoporum	Useful for garden cultivation.
BORAGINACEÆ.		
Cynoglossum—		
latifolium, R.Br.	Broad-leaved Houndstongue	No special economic value, and apt to become weeds in pastures, while the nutlets adhere to wool.
suaveolens, R.Br.	Sweet Houndstongue	
australe, R.Br.	Austral Houndstongue	
Rochelia—		
Maccoya, F.v.M.	White Rochelia	
Lappula—		
concava, F.v.M.	Burr Forget-me-not	
Eritrichum—		
australasicum, A.DC.	Hairy Eritrichum	

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	SYMPETALEÆ HYPOGYNÆ—*continued.*	
BORAGINACEÆ—*continued.*		
Myosotis—		
australis, R.Br.	Austral Forget-me-not ..	Useful in garden cultivation.
suaveolens, Por. (M. exarrhena)	Sweet Forget-me-not ..	
Halgania—		
cyanea, Lindl.	Small-leaved Halgania ..	Have bright blue flowers, and might prove worthy of garden cultivation.
lavandulacea, Endl. ..	Lavender Halgania ..	
Heliotropium—		
Curassavicum, L. ..	Smooth Heliotrope ..	These plants are apt to become troublesome weeds in crops and pastures.
europaeum, L.	Common Heliotrope ..	
asperrimum, R.Br. ..	Rough Heliotrope ..	
Ehretia—		
acuminata, R.Br. ..	Brown Cedarwood ..	The wood is useful for cabinet work.
ERICACEÆ.		
Gaultiera—		
hispida, R.Br.	Waxcluster	The fruits are edible, the flavour is not unpleasant.
Wittsteinia—		
vacciniacea, F.v.M. ..	Baw Baw Berry ..	Worthy of garden culture.
EPACRIDACEÆ.		
Styphelia—		
adscendens, R.Br. ..	Golden Heath	The fruits are edible.
Astroloma—		
humifusum, R.Br. ..	Cranberry Heath ..	The fruits are edible. They have a viscid sweetish pulp with a relatively large stone.
conostephioides, F.v.M. ..	Flame Heath	Worthy of garden cultivation.
pinifolium, Benth. ..	Pine Heath	
Melichrus—		
urceolatus, R.Br. ..	Pitcher Heath	
Cyathodes—		
acerosa, R. Br.	Dagger Heath	
Lissanthe—		
strigosa, R.Br.	Peach Heath	
montana, R.Br. ..	Mountain Peach Heath ..	
Leucopogon—		
lanceolatus, R.Br. ..	Lance Beard Heath ..	All more or less worthy of garden cultivation, especially L. Richei, L. ericoides, L. glacialis, and L. virgatus.
Richei, R.Br.	Coast Beard Heath ..	
australis, R.Br.	Spike Beard Heath ..	
thymifolius, Lindl. ..	Thyme Beard Heath ..	
collinus, R.Br.	Rough Beard Heath ..	
glacialis, Lindl. ..	Twisted Beard Heath ..	
microphyllus, R.Br. ..	Scaly Beard Heath ..	
costatus, F.v.M. ..	Twiggy Beard Heath ..	
virgatus, R.Br.	Snow Beard Heath ..	
Hookeri, Sond.	Mountain Beard Heath ..	
Macraei, F.v.M. ..	Alpine Beard Heath ..	
attenuatus, A. Cunn. ..	Grey Beard Heath ..	
ericoides, R. Br. ..	Pink Beard Heath ..	
cordifolius, Lindl. ..	Heart-leaved Beard Heath	
biflorus, R.Br.	Twin-leaved Beard Heath	
Fraseri, A. Cunn. ..	Slender Beard Heath ..	
juniperinus, R.Br. ..	Prickly Beard Heath ..	
rufus, Lindl.	Ruddy Beard Heath ..	
Woodsii, F.v.M.	Broom Beard Heath ..	
Acrotriche—		
serrulata, Labill. ..	Green Ground Berry ..	The flowers yield honey, but the plants have no other special economic value.
var. ventricosa	Trailing Ground Berry ..	
ovalifolia, R.Br... ..	Coast Ground Berry ..	
depressa, R.Br.	Wiry Ground Berry ..	
Monotoca—		
elliptica, R.Br.	Tree Broom Heath ..	
scoparia, R.Br.	Prickly Broom Heath ..	

Vernacular Names of Victorian Plants—*continued.*

Botanical Name.	*Popular Name.*	*Use or Character.*
Sympetalæ Hypogynæ—*continued.*		
Epacridaceæ—*continued.*		
Brachyloma—		
daphnoides, Benth.	Daphne Heath	Eaten by wallabies in time of drought but of no special economic value.
ciliatum, Benth.	Fringe Heath	
depressum, Benth.	Spreading Heath	
ericoides, Sonder.	Bush Heath	
Trochocarpa—		
Clarkei, F.v.M.	Wheel Heath	Of no known economic value.
Pentachondra—		
pumila, R.Br.	*Dwarf Heath*	
Epacris—		
longiflora, Cav.	Fuchsia Heath	All more or less worthy of garden culture, especially E. impressa, E. longiflora, and E. microphylla.
impressa, Labill.	Common Heath	
petrophila, Hook. f.	Rock Heath	
crassifolia, R.Br.	Thin-leaved Heath	
robusta, Benth.	Round Heath	
obtusifolia, Smith	Blunt-leaved Heath	
lanuginosa, Labill.	Woolly Heath	
paludosa, R.Br.	Swamp Heath	
breviflora, Stapf.	Short-flowered Heath	
bawbawiensis, Stapf.	Baw Baw Heath	
serpillifolia, R.Br.	Thyme Heath	
microphylla, R.Br.	Coral Heath	
Sprengelia—		
incarnata, Smith	Pink Swamp Heath	Worthy of garden culture, especially in moist situations.
Richea—		
Gunnii, Hook. f.	Richea	Of no known economic value.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917.

Conducted at the School of Horticulture, Burnley.

Monthly Report (15th June to 15th July, 1916).

The average temperature for the past month has been low. This fact, in addition to the light rains which have fallen, has kept the yards wet and cold, and has been against heavy laying among the light breeds.

The heavy breeds right through are doing well, and demonstrating their great value as winter layers. The light breeds dry mash section are also giving good returns. Taken altogether, the output is as good as could be expected. Twelve of the heavy breeds and one Leghorn have been broody during the month.

Temperature: Lowest, 32 deg. Fahr.; highest, 60 deg. Rainfall, 162 points.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-17.

Commenced 15th April, 1916; concluding 14th April, 1917.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.6.16	15.6.16 to 15.7.16	Total to Date.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
7	C. J. Jackson	White Leghorns ..	245	122	367	1
25	A. H. Mould	" ..	237	119	356	2
40	A. Brundrett	" ..	247	106	353	3
13	H. J. Meddows	" ..	240	107	347	4
1	G. McDonnell	" ..	229	115	344	5
36	E. W. Hippe	" ..	240	103	343	} 6
27	John Blacker	" ..	250	93	343	
17	W. G. Swift	" ..	255	83	338	8
37	J. M. Smith	" ..	219	111	330	9
41	Excelsior Poultry Farm ..	" ..	237	90	327	10
24	H. N. H. Mirams ..	" (5 birds)	205	118	323	11
38	V. Little	White Leghorns ..	232	90	322	} 12
28	S. Cheatle	R.C.B. Leghorns ..	212	110	322	
10	J. H. Duncan	White Leghorns ..	187	130	317	} 14
22	Mrs. H. Stevenson ..	" ..	198	119	317	
44	J. Jamieson	" ..	204	101	305	16
23	T. A. Pettigrove ..	" ..	202	95	297	17
15	G. Laughlan	" ..	204	85	289	18
16	F. Collings	" ..	230	56	286	19
34	F. G. Silbereisen ..	" ..	210	75	285	} 20
14	W. R. Hustler	" ..	178	107	285	
30	F. T. Denner	"	204	79	283	22
26	Mrs. A. Dumas	" ..	205	69	274	23
18	C. Ludwig	" ..	183	90	273	24
45	C. H. Oliver	" ..	176	96	272	25
3	W. M. Bayles	" ..	213	78	271	26
11	R. W. Pope	" ..	223	29	262	27
32	N. Burston	" ..	168	86	254	28
12	G. Hayman	" ..	196	54	250	29
30	L. McLean	" ..	136	112	248	30
29	A. S. Hyndman ..	" ..	143	93	236	} 31
6	J. J. West	" ..	158	78	236	
21	A. E. Payne	" (5 birds)	153	75	228	33
101	A. E. Silbereisen ..	" ..	106	108	214	34
19	Benwerren Egg Farm ..	" ..	144	61	205	
42	Thirkell and Smith ..	" (5 birds)	144	61	205	} 37
5	W. G. Osburne	" ..	162	43	205	
8	E. A. Lawson	" ..	118	88	206	} 35
43	S. Buscumb	" ..	120	86	206	
20	H. Merrick	" ..	162	20	182	40
35	Tom Fisher	" ..	69	108	177	41
33	E. F. Evans	" ..	91	59	150	42
9	W. H. Clingin	" ..	71	42	113	43
4	Fulham Park	" ..	36	54	90	44
31	J. H. Gill	" ..	58	24	82	45
		Total ..	8,110	3,808	11,918	
		HEAVY BREEDS.				
		DRY MASH.				
98	Marville Poultry Farm ..	Black Orpingtons ..	235	135	370	1
97	D. Fisher	" ..	223	119	342	2
100	Oaklands Poultry Farm ..	" ..	200	121	321	3
94	Mrs. Coad	" ..	160	113	273	4
95	T. W. Pearce	" ..	131	101	232	5
96	H. Hunt	" ..	18	119	137	6
99	J. Ogden	" ..	42	48	90	7
		Total ..	1,009	756	1,765	

Sixth Victorian Egg-Laying Competition, 1916–1917—*continued.*

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.6.16.	15.6.16 to 14.7.16	Total to Date.	Position in Competition.
		LIGHT BREEDS.				
		Dry Mash.				
46	W. H. Robbins ..	White Leghorns ..	274	136	410	1
59	T. A. Pettigrove .	,, ..	273	132	405	2
56	Mrs. Nicoll	,, ..	240	127	367	3
61	C. C. Dunn	,, ..	258	105	363	4
52	W. J. Thom	,, ..	255	99	354	5
54	Mrs. A. O. Hughes ..	,, ..	249	100	349	6
53	W. N. O'Mullane ..	,, ..	244	103	347	7
58	C. Ludwig	,, ..	242	101	343	8
70	G. Wilkinson .. .	,, ..	225	110	335	9
65	Izard and Tierney ..	,, ..	241	93	334	10
62	J. W. Morrow	,, ..	229	91	320	11
47	H. McKenzie and Son ..	,, ..	176	115	291	12
48	Thirkell and Smith ..	,, ..	192	75	267	13
60	A. Greenhalgh	,, ..	175	90	265	} 14
49	C. Lane	,, ..	166	99	265	} 14
55	Rev. J. Mayo	,, ..	181	65	246	16
69	E. A. Lawson	,, .	152	88	240	17
64	A. Bennett	,, ..	193	40	233	} 18
67	Lysbeth Poultry Farm ..	,, ..	147	86	233	} 18
51	Reliable Poultry Farm ..	,, ..	140	64	204	20
50	Clevedon Poultry Farm ..	,, ..	126	53	179	21
63	N. Burston	,, ..	56	103	159	22
66	Benwerren Egg Farm ..	,, ..	64	76	140	23
68	W. G. Osburne	,, ..	63	30	93	24
		Total ..	4,561	2,181	6,742	
		HEAVY BREEDS.				
		Wet Mash.				
74	Oaklands Poultry Farm ..	Black Orpingtons ..	294	120	414	1
89	Brooklyn Poultry Farm ..	,, ..	286	110	396	2
87	S. Buscumb	,, ..	238	115	353	3
72	Marville Poultry Farm ..	,, ..	260	74	334	4
85	Mrs. M. Coad	,, ..	200	128	328	5
83	L. McLean	,, ..	197	130	327	6
92	J. H. Wright	,, ..	195	129	324	7
80	Mrs. M. Pearce	,, ..	213	102	315	} 8
86	C. Ludwig	,, ..	235	80	315	} 8
88	A. D. McLean	,, ..	198	115	313	10
93	L. W. Parker	,, ..	195	108	303	11
79	Stranks Bros.	White Orpingtons ..	206	81	287	12
81	K. Courtenay	Faverolles ..	185	86	271	13
90	Excelsior Poultry Farm ..	Black Orpingtons ..	132	114	246	14
78	Reliable Poultry Farm ..	,, ..	131	114	245	15
77	Mrs. G. R. Bald ..	White Plymouth Rocks	147	70	217	16
91	N. Papayanni	Black Orpingtons ..	106	100	206	17
73	E. W. Hippe	Rhode Island Reds	104	85	189	18
84	H. L. Trevana	,, ..	79	98	177	19
71	C. E. Graham	Black Orpingtons ..	40	95	135	20
76	L. A. Errey	Silver Wyandottes	51	83	134	21
75	Mrs. Drake	Rhode Island Reds	50	58	108	22
82	J. Ogden	Black Orpingtons ..	4	67	71	23
		Total ..	3,746	2,262	6,008	

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

GROWING FEED FOR COWS: LESSONS OF THE DROUGHT.

By Jas. Grant, Dairy Supervisor.

The drought of 1914-15 was disastrous to the dairy farmers of this State generally, for two reasons, one was overstocking, and the other was neglect to make enough provision for a bad winter; dairy farmers were thrown on their own resources, as grass was not to be had at any price.

A few did make provision, amongst them was Mr. Chas. Bland, of Yarram, who, at the beginning of 1915, made up his mind that he was in for a bad autumn and winter. Mr. Bland has a farm of 160 acres, close to Yarram; the land is level, and consists of good, friable loam over a clay subsoil; and is good farming land, except a portion liable to floods along the Tara River.

Of this he cultivated 20½ acres in 1915, Of the 20 acres, he had a paddock of 8½ acres of stubble ploughed up and worked at the beginning of March. This was drilled with 2½ bushels of Algerian oats, and 50 lbs. each of bone and superphosphate; this came up well towards the end of March; another 5 acres of oat stubble was treated in the same way later, and came up in April; also 7 acres was sown with 80 lbs. of wheat, and 80 lbs. of bone and superphosphate—this came up on the 1st June.

On the 14th June, the 8½ acres were ready to be fed off, being then 6 to 8 inches high, fairly thick, and growing well. Into this fifteen milking cows, some of them strippers, were turned. During July, twenty milkers were grazed on the two oat paddocks; and in August, twenty-five milkers were grazed on the 20½ acres, having the run of the three paddocks alternately. There were also on the farm 10 springers, 10 yearling calves, and 4 horses; these, with the cows, had the run of the green feed during August and up to 15th September, when they were all taken off. The yearlings were sold at good prices, and the springers came in in good condition.

The returns for the three months from 14th June are as follows:—

Milk sold last fortnight in June	£14	0	0
Milk and cream sold in July	40	0	0
Milk and cream sold in August	40	0	0
Milk and cream sold to 15th September ...	23	0	0
Profit on yearlings	10	0	0
Grazing springers (5 weeks at 2s. 6d.) ...	6	0	0

Mr. Bland has also from the 20½ acres, 30 tons of good hay, 240 bushels wheat, and a stack of wheaten straw.

These cattle and horses had the run of the rest of the farm, on which there was little grass and less nutriment, till about 1st September. A large number of cows and other cattle died in Yarram district that winter from impaction through want of green feed.

Mr. Bland is satisfied that it pays to grow winter green stuff for the dry cows, as they then come in in good heart, and milk well.

Now, if Mr. Bland had not put in this early green feed, he would have had to see some of his cows die, to sell his yearlings at a low

price, and have his springers come in very poor and weak; nor would he have had the receipts for cream and milk during the three months shown above.

The hay, wheat, and straw he would have had if he had sown later; they are put in to show that, by early sowing, you can get two crops first milk, and later hay or wheat.

The lessons to be learned from the drought are, for South Gippsland, at any rate: to plough stubble early, or have fallow ready in January; work to a fine tilth; drill in in February 2½ bushels Algerian oats, with 100 lbs. suitable manure per acre. If you can do so, cross drill half the seed each way, so that the ground may be covered as soon as possible.

If your ground is in fine tilth, you need not be afraid to sow before rain, no matter how dry the ground is; it is very seldom a crop fails in the autumn if properly put in.

Have a reserve of grass and clover hay cut during good years, or oaten, pea or other straw. (I am not giving advice to the man who fills a silo every year; he does not need it.) Have a stack-yard and make suitable stacks of fodder. Do not be tempted to sell or waste this straw or hay, as droughts will home again as bad, or worse, than 1914-5.

Overstocking.—Do not overstock; do not overstock, especially with dairy cows; this should be stamped on the lining of every dairyman's hat. If you must overstock, stock up with cattle that can be turned off quickly as fats, and so make room for your cows.

You never see a fattener overstock; he always has grass to spare. He can see his mistake, if he overstocks, quicker than a dairyman; it is written quite plainly on the backs of his bullocks, and he can see it every time he goes down the paddock. Again, do not overstock; be able to say, "I am right for the next six months; there is enough green stuff sown, ensilage, hay, and straw in the yard to see me through."

Milk less and better cows; weigh and test milk, and cull heavily; make twenty cows do what thirty are doing; less work, less feed, for the same money. It can be done.

Grow at least half an acre for each cow milked. Let the green feed get a good start before putting stock in—another week's growth in the early stages will give you a lot more feed later on.

It pays to grow feed and milk in a bad year—many dairymen got 2s. 3d. for butter fat last winter.

Do not give a weak cow dry chaff. A strong cow will do better on chaff that has had boiling water put on it, and covered for twelve hours. Dry chaff is very injurious to a weak cow.

Keep your herd young—the old cows were the first to go—very few cows are worth keeping over nine years old.

Have drinking water in troughs at convenient and accessible spots—one at the yard, if possible. Weak cows are afraid to go down steep or into boggy places for a drink, and so become very thirsty. When they at last go in they drink too much, and get chilled, and are unable to get out again.

Many dairymen lost enough cows through this cause to put up three wind-mills, let alone one.

Do not milk your cows too long in the face of a bad season and no green feed. It is hard to notice the falling off in condition from day to day. Keep a close watch, and when cows start to lose condition rapidly, dry them off at once. Provide good winter paddocks for your

dry cows, for it pays to have your cows come in half fat. Even if it cost you 10s. per head more for grass, the cow will be worth 10s. more to look at, let alone the extra money she will give you, because she is in good condition in the spring.

This is not written to puff up any particular farm or district; what Mr. Bland has done, any ordinary dairy farmer can do. The only unusual feature was the mild winter of 1915. There is no expensive machinery to be got, no cutting, carting, and hand feeding of green stuff. Do as he and others have done. Look ahead: start putting in crop early, subdivide farm, and have some definite plan to work to

VICTORIAN RAINFALL.

Second Quarter, Year 1916.

During April the rainfall in the north and north-western areas was very small, and was much below requirements, but the remainder of the State fared much better, more especially in the north-east and central districts. The early rains were the results of tropical disturbances and benefited the eastern districts only; but the remainder of the disturbances being Antarctic in character were of especial benefit to the southern areas mainly. An extremely dry month was experienced in May, and only about half of the usual quantity of rain was received, the greatest deficiency occurring in the western and Wimmera districts. This was an extremely cold month, and frosts were very prevalent towards the end, there being six consecutive days of frost which penetrated to most inland districts except Gippsland. Frost visitations of so early a character, and so severe a nature, have been unknown in Victoria in the past, and these constitute a record for severity and frequency in May. The month of June was extremely favorable, both with regard to the amount of rain and the period over which the falls extended, almost general rains being experienced on nineteen days; except in Gippsland and parts of the central south, the amounts were much above the normal, northern Mallee and the northern Wimmera showing the greatest excesses. Owing to a large amount of dry grass and a slight mixture of green, Mallee stock in April, though falling away, were still in fair to good condition. The chief concern was for the welfare of the lambs as the dry feed would not be conducive to progress. The same applies to parts of the west; elsewhere stock were in splendid condition.

In north-western areas the water supply was deficient. Water was also scarce in these parts during May, and water cartage had commenced. Stock were fair to good, and in the west much sown grain had germinated, but had died off. Potato yields were generally satisfactory except in the north-central. At the end of June, owing to the abundance of rains, grass was plentiful, the crops were showing up well above the ground, but in the Wimmera the sowing had to be deferred and most of the crops in this district will be late. Complaints with regard to want of water for stock and domestic purposes have now

vanished. In the west some bitterly cold weather and severe frosts were experienced, and in the neighborhood of the plains grass and crops were backward and paddocks bare. Sheep were doing well throughout, and lambing percentages promised to be high.

District.	—	April.	May.	June	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean	25	77	211	313
	Normal	78	114	124	316
	Per cent. departure from normal	−68	−32	+70	−1
Mallee South	District Mean	40	74	253	367
	Normal	101	132	166	399
	Per cent. departure from normal	−60	−44	+52	−8
North Wimmera ..	District Mean	56	75	336	467
	Normal	130	163	208	501
	Per cent. departure from normal	−57	−54	+62	−7
South Wimmera ..	District Mean	93	84	370	547
	Normal	154	192	264	610
	Per cent. departure from normal	−40	−56	+40	−10
Lower Northern Country	District Mean	61	101	316	478
	Normal	119	166	207	492
	Per cent. departure from normal	−49	−39	+53	−3
Upper Northern Country	District Mean	108	111	331	550
	Normal	150	195	257	602
	Per cent. departure from normal	−28	−43	+29	−9
Lower North-East ..	District Mean	191	132	522	845
	Normal	177	251	366	794
	Per cent. departure from normal	+8	−47	+43	+6
Upper North-East ..	District Mean	378	238	573	1,189
	Normal	264	370	585	1,219
	Per cent. departure from normal	+43	−36	−2	−2
East Gippsland ..	District Mean	131	102	202	435
	Normal	239	254	316	809
	Per cent. departure from normal	−45	−60	−36	−46
West Gippsland ..	District Mean	281	191	327	799
	Normal	283	300	350	933
	Per cent. departure from normal	−1	−36	−7	−14

VICTORIAN RAINFALL—*continued.*

District.	—	April.	May.	June.	Quarter.
		Points.	Points.	Points.	Points.
East Central	District Mean.. ..	304	189	298	791
	Normal	272	305	338	915
	Per cent. departure from normal	+12	−38	−12	−14
West Central	District Mean.. ..	173	99	255	527
	Normal	195	217	242	654
	Per cent. departure from normal	−11	−54	+5	−19
North Central ..	District Mean.. ..	181	136	371	688
	Normal	189	250	327	766
	Per cent. departure from normal	−4	−46	+13	−10
Volcanic Plains ..	District Mean ..	153	69	312	534
	Normal	190	226	266	682
	Per cent. departure from normal	−19	−69	+17	−22
West Coast	District Mean.. ..	235	140	401	776
	Normal	241	303	354	898
	Per cent. departure from normal	−2	−54	+13	−14

N.B.—100 points = 1 inch.

11th July, 1916.

H. A. HUNT,
Commonwealth Meteorologist.

ORCHARD AND GARDEN NOTES.

(E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.)

The Orchard.

If the winter spraying has been delayed, it should be completed as quickly as possible, and before the buds begin to swell and burst.

It is not advisable to spray the stone fruits with the red oil emulsion at this time, as there will be danger of burning and destroying the e1r y buds that may be swelling, and consequently loosen their outside scales. It wil' be safe, if the work be done at once, to spray apple, pear and quince trees with this spray, especially where the Byrobia Mite, scale insects, or woolly aphis are prevalent.

If it is intended that the lime-sulphur wash be the specific for these and other pests, it may be used with safety, although the spraying

should be completed as early as possible. This mixture has a certain value as a fungicide, and it is well worth trying on peach trees that have been affected with the leaf curl; more especially in view of the fact that in some districts severe burning has occurred in peach orchards as a result of using Bordeaux mixture late in the season.

Where peach aphis has appeared, it will be advisable to spray at once with a strong nicotine solution. Tobacco stems should be soaked in cold water for some days, adding a teaspoonful of caustic soda to a cask of steeping stems. The liquid should be made strong, and every endeavour should be made to kill out the first insects that appear.

The pruning of deciduous trees should be at an end this month. The pruning of evergreens such as oranges, lemons, and guavas, may be left until later.

Young deciduous trees should be planted not later than this month. The soil should be trodden firm round the roots, and, when planting has been completed, the tree should be headed back to three or four buds on each arm.

Preparation may be made for planting citrus and other evergreen trees. The soil should be well ploughed and sweetened in anticipation of planting in September and October.

In root-borer affected districts, the beetles will begin to appear during the latter part of the month. A close observance should be kept on them and the insects should be regularly collected and destroyed.

The Vegetable Garden.

The plots should be well dug over at this time, adding gypsum or lime where any pests have been prevalent. In other beds stable manure should be well worked into the soil.

The soil should be rich, well worked, and warm, so that a quick growth may result. Vegetables grown quickly are generally more tender than slowly grown ones; and frequent changes of crops in the plots will give better results. At this season, the weeds will require constant checking; frequent use of the hoe will, therefore, be necessary, and in the rows hand-weeding should be resorted to.

All seedlings should be planted out, especially seedlings of cabbage, cauliflower, lettuce, and onion. Seeds of peas, carrots, parsnips, radish, lettuce, tomato, and broad beans may be sown.

Where they can be sheltered and protected from frosts, young tomato plants may be planted out for early fruiting. One method of managing these early plants is to place the young plant a few inches below the surface, and then a box, 8 or 9 inches deep, with top and bottom removed, over the plant at ground level. This can then be covered loosely with a piece of glass whenever necessary.

Potatoes, artichokes, and asparagus crowns may be planted. Asparagus beds should be kept free from weeds; they shou'd have a loose surface, and a light top dressing with old manure would be beneficial.

In the frames, cucumber, vegetable marrow, melon, pumpkin, water and rock melon seeds may be planted. These are best planted in pots, placing three or four seeds in each pot. They then suffer no check when being transplanted into beds.

The Flower Garden.

All winter-flowering shrubs that have dropped their blossoms may now be pruned. It is important to prune these immediately after flowering, so that the plant may be able to make plenty of flowering wood for next season.

Seed beds and plots need constant cleaning and weeding. Weeds must now be kept out of the garden, both by hoeing and hand picking. The seedlings that are growing in their permanent situations should be thinned out and given a good chance to develop strong and sturdy plants.

Divisions of herbaceous plants such as delphiniums, cannas, shasta daisy, herbaceous chrysanthemums, rudbeckias, salvias, and phlox, may be still planted out. If it is intended that such plants shall remain in the same location as last season, they should be lifted, the soil being well dug and manured, and the crowns planted back again. By this means the plants retain their vigour, and are able to produce good flowers each season.

Evergreen shrubs may now be planted out, the soil having previously been well dug and aired. All beds should be well dug over by this time, manure and refuse litter having been dug into the soil.

A few corms and tubers of early summer flowering bulbous plants may now be planted.

REMINDERS FOR SEPTEMBER.

LIVE STOCK.

Horses.—Still continue to feed stabled horses well; feed green stuff if available. Continue rugging to encourage the shedding of the coat; good grooming will also be beneficial. Continue giving hay or straw to grass-fed working horses. Feed old and badly-conditioned horses liberally. In foal mares due to foal early, if worked, should be turned out to paddock. Feed stallions doing stud duty liberally. Equivalent amount of cracked Indian corn (maize) may with advantage be substituted for oats, if latter grain is scarce.

Cattle.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Year-Book of Agriculture*, 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland :—Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ½ lb. daily of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

Pigs.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be

turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Considering the present high price of pork, there should be a good margin of profit in fattening pigs. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

Sheep.—Wherever early shearing is possible, and shelter available, all sheep to be disposed of can be fattened earlier, if shorn. Sheep or lambs not good enough for freezing also thrive better after being shorn. Where insufficient knowledge of grading cross-bred wool exists, draft the coarse sheep from the fine before coming into the shed, and shear and bale separately. Clean all daggy sheep before bringing them on to the shearing board. Avoid deep and careless skirting. Only dense seedy parts, and heavy fribs and stains should come off fleeces. Press in a box press, which forms square sides to bales, and avoid round bales, called "Sew Downs." Brand boldly and neatly on the long and narrow side. Clean carefully all straw, chaff, &c., from shearing place. Cut back all misshapen feet when noticed during shearing.

Poultry.—September is one of the best months for hatching for winter eggs. Incubators should be kept going, and broody hens set. Care must be taken to keep down vermin, as they now breed quickly; use sprays in houses and Insectibane or Izal in nests—nothing stunts chickens quicker than vermin. The food for young chicks should be fine oatmeal, stale bread crumbs or biscuit meal, a little calcined bird's grit, a little chopped green stuff such as lettuce, thistles, or green lucerne or spring onions occasionally cut fine is a good tonic, and a pinch of powdered charcoal. Slightly moisten with new milk. Make the whole friable, and feed frequently ("little and often") just as much as they will readily eat, as an excess of food only sours and disturbs their digestive organs. Animal food may be given in small quantities after the first ten days once or twice a week. Chickens should be protected from damp ground and the cold, bleak winds.

CULTIVATION.

Farm.—Plant early potatoes, and work up fallow for the main crop. Keep fallow for summer forage crops well worked up with the disc and harrows. Make early sowings of mangolds, beet, field carrots, and turnips. Push on with the fallowing in the Northern Districts. Prepare land for tobacco seed beds by burning rubbish on the site; afterwards work up to depth of three or four inches.

Orchard.—Commence spring ploughing; plough in leguminous crops for green manure as soon as the plants are in full flower. Finish grafting early in the month. Spray peach and apricot trees with Bordeaux mixture as the blossom buds are opening, as a preventive against "leaf curl" and "shot hole" fungi; watch for peach aphis, and spray when present with tobacco solution.

Flower Garden.—Cultivate and work up the surface to a fine tilth—clear out all weeds. Water newly-planted shrubs, &c., if the weather is dry. Plant out cannas, early dahlias, chrysanthemums, gladioli, and other herbaceous plants.

Vegetable Garden.—Plant out seedlings. Sow seeds for summer use, such as tomatoes, cucumbers, marrows, pumpkins, melons, &c. Plant out tomatoes, and shelter till frosts are over. Hoe and work up the soil surface.

Vineyard.—Plantation of young vines (grafted or ungrafted) should be concluded before the commencement of September; pruning of old vines likewise, as well as tying down of rods on long-pruned vines. Prune recently-planted vines just before buds commence to swell (if not pruned when planted), cutting strongest cane back to two buds. Do not delay this work until buds have shot, as this seriously weakens the young vine. Field grafting may be carried out, if weather be fine and warm. If cold and wet, postpone until October. Swab with acid iron sulphate vines which showed signs of Black Spot last season. To avoid burning, this must be completed before the buds commence to swell. Cultivation (scarifying or discing) must receive attention when soil is in suitable condition.

Cellar.—Conclude spring racking early in month, if not already done. Fill up, regularly, all unfortified wines.

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FOOD VALUES AND RATIONS.

By B. A. Barr, Senior Dairy Supervisor.

The total amount of essential constituents in cattle food determined by chemical analysis does not give any definite information of their respective food values. It serves to show in what proportions the constituents are present, but it does not reveal whether they are in a condition to be readily digested, nor does a scrutiny of the figures convey any knowledge of that amount of nourishment available for animal nutrition.

Nevertheless, a chemical analysis is the first step to a comparison of relative food values, and the average obtained from a large number of samples is taken to represent the average composition of any particular variety of foodstuff. As a result of feeding trials, the percentages of digested protein, carbohydrates, and fat—called digestible nutrients—are found. This data furnishes coefficients of digestion, which find application in general practice. In addition to a knowledge of the amounts of digestible nutrients in any food, it is important to know the cost of digestion, *i.e.,* the amount of energy expended in rendering the digestive matter to an assimilable state, as shown in Table I. The energy expended in digestion reduces the value of the digested materials by the amount used, and the difference between the total energy of the digestible foodstuff and that used in digestion is net gain to the animal, which may be used for milk production. The cost of digestion varies according to class of foodstuff. Green grass is more easily digested than dry grass. Hay cut on green side is more easily digested than hay cut almost ripe. Pollard is more easily digested than bran. Crushed oats are more easily digested than whole oats.

Some of the factors which influence the cost of digestion are, the variety of food, its chemical and physical condition. A food in a finely-divided state is digested at a lower cost than some of the same variety in a coarse state. The stage of growth at which hays are cut influences both the digestibility and cost of digestion; as the plant ripens the

percentage of crude fibre increases, thus rendering digestion both more costly and slower. The more slowly digestion proceeds the greater will be the loss from fermentation.

The cost of digestion must not be confused with the digestibility of a food.

Digestibility regulates the proportion digested, which is the difference between the amount consumed and the solid manure. The cost of *digestion is a charge made against the food in changing it from the undigested to the digested condition.*

TABLE I.

STARCH EQUIVALENTS.

	In original sample.	Digested.	Available for use after deducting cost of digestion.	Percentage of original.
Bran ..	90	58	48	55
Oats	99	70	64	64
Lucerne hay ..	85	51	33	39
Oaten hay ..	90	45	30	33
Oat straw ..	82	40	16	19

The above table must not be used to compare the relative values of the foods included. It serves only to compare the amounts of food substances—reduced to a starch equivalent—in the original food with that which is available for use of the animal.

Using as an illustration the two extremes—oats and oaten straw—it will be noticed that from 99 starch equivalents in oats, 64, or 64 per cent., represent net gain; 82 starch equivalents in oaten straw, 16, or 19 per cent., represent net gain.

In the case of the former, 34 per cent is not available, due partly to a portion being indigestible, and partly to the energy consumed in digestion, whilst the latter shows a loss of 71 per cent. from the same causes, but largely owing to the heavy expenditure in digestion.

A striking example is afforded in the following, which demonstrates the value of silage, and provides a reason for what has frequently been proved in practice:—

ORIGINAL FOODSTUFFS.

	Protein.	Crude Fibre.	Carbohydrate.	Fat.	Starch equivalents.
	%	%	%	%	
Oaten hay ..	6	20	53	4.0	90
Oaten silage ..	3	9	21	1.5	37

DIGESTIBLE NUTRIENTS.

	Protein.	Crude Fibre.	Carbohydrate.	Fat.	Starch equivalents.
Oaten hay ..	3.5	9	28	2.5	45
Oaten silage ..	2.0	6	15	1.0	26

NET AMOUNT AVAILABLE FOR NUTRITION.

Digestible—Cost of Digestion.

	Protein.	Carbohydrate.	Fat.	Starch equivalents.
Oaten hay ..	2.5	26	2.0	30
Oaten silage ..	1.6	17	.8	20

Comparison by the use of the starch equivalent, although unsatisfactory, is perhaps the best system in use at present, provided comparisons are restricted to members of natural groups, as green fodder and hays, grains, mill products, oil meals. The 30 net starch equivalents contained in 100 lbs. of hay may be compared with 20 in oaten silage. provided each is of good quality, and the deduction that 1 lb. oaten hay equals 1½ lbs. silage is supported by practice. In fact, when a scarcity of green feed prevails, the value of silage is greater, owing to its succulence. To compare the starch equivalents of bran with those of the oil meals or hay is incorrect, and would lead to wrong conclusions, because the three substances named differ greatly in composition and belong to separate groups. When the protein and carbohydrate are used to perform similar functions, viz., heat production, the use of starch equivalents may be made to all classes of foodstuffs.

For this purpose protein is too expensive, and when used, as they should be, in the performance of dissimilar functions, viz., protein for development, repair of tissue and milk secretion, carbohydrate and fat for production of heat and formation of fat, no comparison between the nitrogenous and non-nitrogenous constituents is possible. For this reason cattle foods are arranged in groups.

Hays.—To provide the nutrients necessary for maintenance when grasses or green fodder are insufficient for the total food supply, when only a small quantity of milk is yielded.

Grasses, Clovers, and Green Fodder.—To supply sufficient to meet all needs.

Concentrates.—To provide sufficient nutrients for milk supply when a deficiency occurs in natural pasture.

In practice no attention need be given to the analysis of ordinary green crops or hays, insomuch as the analyses show that wide variations are greatest amongst individual samples of the same variety. Season. soil, climate, manure, farming practice. and stage of growth are all factors which influence the value of green fodders and hay. The following may be accepted as generalized statements:—Lucerne hay makes the best roughage, then follow clover, mixed grass, and cereal hays, when grown and harvested under favorable conditions. Green oats are preferred by cows to green barley, and have also a higher value for milk production. Barley grows more vigorously in the early stages of growth than oats.

Hays cut green are more nutritious than hays cut at a later period Millet is superior to maize for milking cows. Maize yields a heavier crop and makes excellent silage.

VICTORIAN ANALYSIS OF CONCENTRATES.

(Showing percentages of nutrients available for milk prodnction.)

Foodstuff.	Protein.	Carbo-hydrate.	Fat.	Total starch equivalent.	Nutritive ratio.	Price.	Cost per lb.
	%	%	%				d.
Oats ..	8·5	43	4	64	1 : 6	2s. 6d. per bushel	·75
Barley ..	9	64	2	80	1 : 8	3s. 6d. ,,	·8
Maize ..	7	66	4	86	1 : 11	5s. ,,	1·0
Bran ..	9	32	2·	48	1 : 4	£5 per ton	·6
Pollard ..	10	55	3	75	1 : 6	£6 ,,	·7
Polly feed ..	14	52	2	75	1 : 4	£5 ,,	·6
Linseed oil meal	26	32	9	87	1 : 2	£10 ,,	1·2
Coconut oil cake	19	42	5	78	1 : 3	£12 ,,	1·3

The above table comprises standard concentrates. There are many others in the market, particularly mill offals, but owing to the great variations in composition, their inclusion is unwarranted. Where the feeder is obtaining good results from their use, he should continue; but, if frequent fluctuations are noticed in the results, it would be advisable to discontinue and make use of some concentrate more constant in value.

The amount of net available nutrients in a food does not of itself fix the food value, even when different foods are obtainable at the same price. The palatability and quantities which may be fed without causing digestion troubles are important factors. Excessive quantities of oil meals should at all times be avoided, and a lesser quantity given in summer than in winter. A mixture of concentrates is preferable to the sole use of any particular one.

In selecting rations for dairy cows under local conditions, a difficulty arises in determining both the amount and quality of feed obtained in the paddock; whether it is sufficient to enable the cow to produce her maximum quantity of milk or only a portion of it. If sufficient is obtained in the paddock, then any addition is unnecessary, but if the paddock feed is only sufficient to produce 2 gallons daily and the cow can on suitable feed produce 3 gallons, then it will be profitable—when prices for butter fat and concentrate are normal—to supplement the feed with the requisite amount of foodstuff. The dairy cow is always most profitable when yielding her maximum. It is not an easy matter to tell when the individual members of a herd are producing their maximum amount of milk. Sometimes, condition acts as a rough guide. Cows putting on fat without increasing the flow of milk may be regarded as producing their best. The lower yielding cows may be compared with the higher. If in the same herd some cows are producing 4 gallons, one can readily assume that those giving 3 gallons on the same food and under equal conditions are not likely to profitably increase on receiving additional food. When a cow is losing condition it is a sure indication that her food supply is insufficient and should be increased, particularly by the addition of concentrates. This does not apply to fat newly-calved cows, and conversely where hand-feeding is practised, the putting on of fat should be regarded as a sign that the animal—from a milking view—is not making the most profitable use of her food, which should accordingly be reduced, unless it be for a drying cow to build up in preparation for the ensuing season.

The first question to be considered in the feeding of milking cows is: Are they yielding their maximum amount of milk? If not, what kind and quantity of feed are necessary for them to do so, and will it pay to provide the amounts? The first question can only be answered by increasing the feed and noting the result, the second by a consideration of the increase expected, the prices and food values of common cattle foods.

The food of a milking cow is used for two purposes—

1. *Maintenance.*—The upkeep of the body and development of the fœtus or unborn calf.

2. *Milk Secretion.*—The amount of food nutrients required for the maintenance of an average cow is—protein .5 lbs., carbohydrate 5 lbs., as determined from the average analysis of locally-grown foodstuffs. The above amounts were found by the writer to be sufficient for in-calf cows

during the past drought in two herds under observation, when the whole of the food consumed was hand-fed.

In a cold district a slightly increased amount would be necessary.

15 lbs. of good cereal hay contain the above amount, and for general application may be regarded as sufficient for maintenance.

The maintenance or basal part of the ratio should be supplied as hay, green fodder, or silage, and that required for milk production as concentrates.

A guide to the amount of food required for milk secretion may be obtained from a scrutiny of the composition of average milk.

AVERAGE COMPOSITION OF 4 PER CENT. MILK.

Protein.	Carbohydrate.	Fat.	Starch equivalent of fat and milk sugar.	
3·4 %	4·7 %	4 %	14·7	
·034 lb.	·047 lb.	·04 lb.	·147 lb.	Nutritive ratio, 1 : 4

The nutrients of the food are transformed into the nutrients of milk, and since the protein of the milk can only result from the protein of the food, .034 lb. of vegetable protein is essential for each lb. of milk secreted. But owing to variations in composition of foods and for other reasons outside the scope of this article, the minimum in general practice should not be less than .045 lbs. protein and .15 lbs. carbohydrate (the fat or ether extract is reduced to its carbohydrate equivalent) for each lb. of milk in addition to the allowance for maintenance. A simpler method suitable for general practice is to allow 1 lb. of mixed concentrate made from some of the following—bran, polly feed, oats, linseed meal, pollard, coconut oil cake—for each 2½ lbs. to 3 lbs. of milk, according to quality of milk:—

SUITABLE PROPORTIONS FOR MIXTURE.

Bran ..	300	Crushed oats..	250	Bran ..	300
Polly feed ..	200	Bran ..	250	Polly feed ..	200
Oil meal ..	75	Oil meal ..	75	Pollard ..	150

When the paddock feed is insufficient for milking cows, though perhaps sufficient to keep dry ones in good condition, it is inadvisable to fill the milkers with chaff or hay. Concentrates are wanted. The oft-repeated saying "that hay causes the cows to dry off" is not due to any principle in the hay producing this effect, but is due to the fact that hay or chaff alone does not contain sufficient nourishment to supply the heavy demand made by the milking cow. A cow yielding 4 gallons of milk daily uses about 35 per cent. of the nutrients in her food for maintenance, the remaining 65 per cent. are utilized in milk production, whilst of the protein alone only 20 per cent. goes for maintenance and 80 per cent. for milk. It is hoped that whilst prices remain as at present dairy-farmers will take the opportunity of getting the most out of the cows by the general use of concentrates. It pays to give the best to good cows; to the other kind it does not pay to give anything. At current rates (August), 1 lb. of bran or polly feed costs 6d., and the same amount of oil meal 1.2d., whilst 2½ lbs. of 4 per cent. milk is worth 2d. for separation and 3.3d. for town milk supply.

The following rations were used by various dairymen during June, July, and August. The nutritive contents, based on the average composition of local foolstuffs, are given in detail to illustrate the relative values

of the rations. It will be noticed that the amount of milk produced from 1 lb. of concentrates varies according to the richness of the feed. In every case the herds comprise mixed cows in all stages of lactation.

No. 1.

SITUATED NEAR MELBOURNE.

June, 1916—66 cows; daily average, 19½ lbs.; best cow, 48 lbs.

Average Ration.	Protein.	Carbohydrate.	Fat.	Price. per ton.	Cost per cow per day.
	%	%	%	£ s. d.	d.
7 lbs. bran ..	.63	2.24	.14	5 0 0	4.2
1½ lbs. polly feed	.21	.78	.03	5 5 0	.9
	.84	3.02	.17		5.1
16 lbs. chaff ..	..	..	..	3 10 0	6.0
					11.1

Notes.—No paddock feed, except 2 bales lucerne hay at night. Milk sold wholesale.

The cost of chaff for maintenance is greater than cost of concentrates for milk production. Concentrates cost 2.6d. per gallon. Total feed costs 5.6d. per gallon. Cows yielding over 2 gallons receive a *proportionate increase of feed.*

July—70 cows; daily average, 20 lbs.; best cow, 40 lbs. Feed—Bran increased by ½ lb; chaff increased by 1 lb., and 1 lb. branning added.

August—65 cows; daily average, 22 lbs.; best cow, 39 lbs. Feed—Bran increased to 8 lbs., otherwise feed the same as last month.

No. 2.

GIPPSLAND FARM.

June, 1916—9 cows; daily average, 36 lbs.; average test, 4.8 per cent.; best cow, 56 lbs.

Ration.	Protein.	Carbohydrate.	Fat.	Price. per ton.	Cost per cow per day.
	%	%	%	£ s. d.	d.
2 lbs. bran ..	.18	.64	.04	5 0 0	1.2
1 lb. linseed oil meal ..	.26	.32	.09	10 0 0	1.2
	.44	.96	.13		2.4

Note.—Grazing good crops of green oats and barley alternatively.

Concentrates cost .63d. per gallon, or 1.4d. per lb.; butter fat at 1s. 9d.

July—10 cows; daily average, 34 lbs.; average test, 5 per cent.; best cow, 52 lbs. Same feed; abundance of grass.

August—13 cows; daily average, 30 lbs.; average test, 5 per cent.; best cow, 50 lbs. Same feed. Cows rugged.

During 86 days in May, June, and July, two cows in this herd yielded respectively 4,326 lbs. of 3.9 per cent. milk, and 4,271 lbs. of 5.2 per cent. milk, averaging over that period 50 lbs. and 49¾ lbs. per day. One-half of milk is separated, and the rest sent to condensing

factory. During July this herd averaged 21s. 6d. per cow weekly. Although there is an abundance of grass and green feed, concentrates are used. To use the words of the owner, concentrates put a little substance into the cow, and give her something to work upon.

No. 3.

NORTH-EASTERN DISTRICT FARM.

June, 1916—25 cows; daily average, 27½ lbs.; average test, 5.4 per cent.; best cow, 31 lbs. A very even herd of high testing and consistent milkers.

Ration per cow.	Protein.	Carbohydrate.	Fat.	Price.	Cost per day per cow.
				per bushel.	
	%	%	%	£ s. d.	d.
3 lbs. crushed oats	.25	1.20	.12	0 2 1	1.8
				per ton.	
2 lbs. polly feed	.28	1.10	.04	5 5 0	1.2
2 lbs. bran ..	.18	.64	.04	5 0 0	1.2
2 lbs. coconut oil cake ..	.38	.84	.10	12 0 0	2.6
1 lb. linseed oil meal ..	.26	.32	.09	10 0 0	1.2
	1.35	4.19	.39		8.0

Notes.—As much grass silage as cows will consume. Paddocks bare. Dry and young stock fed on silage to keep alive. Season very bad. Cows rugged.

No chaff given. Ration fed moistened in bails. Concentrates cost 2.6d. per gallon, or 5.2d. per lb. butter fat at 1s. 6d.

The above ration appears to be costly, but it must be remembered that without supplementary feed the silage is only sufficient to keep the dry stock in fair condition. Without the silage the stock would die, as the paddocks are too bare for sheep. Assuming the silage to be required for maintenance and the concentrates available for milk production, the cost of concentrates is 5s. 9d. per week. The butter fat return average for month 17s. 6d. per week. When the season improves the herd will be in full profit and the cost of production will be reduced considerably.

July—22 cows; daily average, 28 lbs.; average test, 5.5 per cent.; best cow, 37 lbs. Feed—same concentrates as last month. To conserve silage, a portion has been replaced with grass hay.

August—31 cows, including 12 heifers on 1st calf; daily average, 26 lbs.; average test, 5.4 per cent.

Ration per cow.	Protein.	Carbohydrate.	Fat.	Price.	Cost per cow per day.
				per bushel.	
	%	%	%	£ s. d.	d.
3 lbs. crushed oats	.25	1.2	.12	0 2 1	1.8
				per ton.	
2 lbs. polly feed..	.28	1.1	.04	5 5 0	1.2
3 lbs. bran ..	.27	.96	.06	5 0 0	1.8
2 lbs. linseed oil meal ..	.52	.64	.18	10 0 0	2.4
	1.32	3.9	.4		7.2

Note.—Same paddock feed as last month.

By changing ration a saving of 1d. per cow daily was effected without influencing the milk yield, because the decrease from 27½ lbs. to 26 lbs. is accounted for by advanced lactation of best cows and calving of first year heifers.

Note.—That by selection of foods the same amount of nutrients may be obtained at reduced cost.

Concentrates cost 2.7d. per gallon.

No. 4.

Situated near Melbourne.

June, 1916—20 cows; daily average, 21¾ lbs.; best cow, 32 lbs.

Ration per cow.	Protein.	Carbohydrate.	Fat.	Price.	Cost per cow per day.
	%	%	%	per ton. £ s. d.	d.
3½ lbs. polly feed	.5	1.82	.07	5 5 0	2.1
3 lbs. crushed oats	.25	1.29	.12	per bushel. 0 2 1	1.8
	.75	3.11	1.9		3.9
6 lbs. chaff ..	..	..	..	per ton. 3 10 0	2.25
					6.15

Note.—Short paddock feed, occasionally graze barley crop. Cows rugged.

Concentrates cost 1.8d. per gallon. Total feed costs 2.8d. per gallon

July—20 cows; daily average, 22 lbs.; best cow, 32 lbs. Feed changed to 3 lbs. polly feed, 2½ lbs. bran, 1¾ lbs. crushed oats. Daily cost increased to 4.3d. per cow.

August—20 cows; daily average, 19 lbs. per cow. Feed increase to 4 lbs. bran, 3 lbs. polly feed, 2½ lbs. crushed oats, and 7½ lbs. chaf costing for concentrates 4.9 per cow daily, and 2.6 per gallon. Th amount of milk yielded does not require this amount of concentrat The increase is unnecessary and too costly. In June the cost of concen trates was 1.8d. per gallon on 21¾ lbs. average; in August the cost ha increased to 2.5 per gallon on 19 lbs. average. The paddock feed wa apparently the same during each month.

No. 5.

Situated 30 miles from Melbourne.

August, 1916—124 cows; daily average, 21 lbs.

Ration per cow.	Protein.	Carbohydrate.	Fat.	Cost per cow per day.
	%	%	%	d.
6¼ lbs. bran	.58	2.08	.05	3.9
1½ lbs. linseed meal ..	.39	.48	.13	1.8
	.97	2.56	.18	5.7

Notes.—Very short paddock feed. Milk sold wholesale.

34 lbs. maize silage and 10 lbs. oaten chaff.

Concentrates cost 2.7d. per gallon.

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The daily averages on the above farms were obtained in all cases, but the last from the records of weights recorded each milking, and from the gallons of milk sold during the month.

Attention is directed to the economy of changing feed in No. 3.

The suggestion is made to dairy-farmers depending during winter months on pasture and hay to try the effect of 3 lbs. to 8 lbs. concentrate per cow per day.

The amounts will be regulated by the amount of milk produced and its value. At the present time dairy products are bringing high prices, and every effort should be made to bring about profitable increases. When the herd is maintained at its maximum, not only is the output greater, but the season is longer. When all the food required to maintain a good herd producing to its full capacity throughout the season can be provided by the farm, the profits must necessarily be greater; but if at the present time the cows cannot obtain sufficient food on the farm, and will not pay for purchased foodstuffs, or do not make profitable use of food supplied by the farm, they may be classed as cows, but not dairy cows. The chief object in feeding is profit.

WHILST many farmers complain that they have not the wherewithal to improve their land, enormous bodies of material lie wasting on unproductive areas. Ditches, so necessary to every type of farm, may be made to yield large quantities of useful soil dressings. The heavy deposits of silt, peaty and turfy matters found in hollows and by streams is to be regarded as the most substantial and profitable form of dressing for any land. The keeping of animals will insure the largest possible return to the soil, in place of that taken by the growing of crops. By these means, all of which are more or less within our power, we may actually add to the depth and value of soil, and thereby place ourselves in a better position to face droughts and bad seasons.

Crops of various kinds, be they animal or vegetable, exhaust or refresh soil in fixed proportion to the extent of their waste, and return. In warm climates it is ever an affair of bulk. Not one or all of the chemical manures can so affect the temperature and moisture-holding conditions of the soil as to facilitate the action of bacteria for more than a brief season. The actual fermenting medium must be supplied from what we may term natural sources. Green manures, bulk manures from the farmyard, surface materials, which are well charged with organic waste—these are the things to which we must eternally look if we are to create such bodies of active soil as will insure permanent occupation and profit from any piece of land. The amount to be applied may vary in degree, but sooner or later it must become exhausted, if it receives not more or less of each or all of these materials.

APPLE CULTURE IN VICTORIA.

(Continued from page 479.)

By J. Farrell, Orchard Supervisor.

LAYING OUT THE ORCHARD.

The continually increasing cost of labour, implements, and spraying materials required in the orchard, the difficulties met with in the local marketing of fruit during years of heavy crops, and the keen competition by fruit-exporting States in the world's markets, are the chief factors which should influence the fruit-grower to adopt all the modern methods which tend towards the economic working of the orchard. Amongst those, the method of planting the orchard plays a most important part.

THE SQUARE SYSTEM OF PLANTING.

When an orchard is being laid out the trees should be planted in such a manner as to make sure of their subsequent cultivation and general management being carried out on sound commercial lines.

The square method of planting is mostly practised in this State. By this method the rows of trees are placed at right angles to the headlands. This facilitates cultivation and spraying, &c., and is generally better adapted to irrigation, whether from channels or dams, than when the trees are planted under systems which do not permit of the rows being so placed.

When the hexagon or other methods of planting, by which the rows are placed in diagonal lines to the headlands, are employed they usually prove inconvenient, and particularly where irrigation and drainage are involved.

DISTANCE BETWEEN TREES.

Great diversity of opinions existed amongst the early growers as to the proper distance apart at which the trees should be planted. But the 16 feet by 16 feet and 18 feet by 18 feet were the distances mostly favoured.

In the light of experience and more matured knowledge, however, growers who have established commercial orchards, during recent years, almost invariably planted 20 feet by 20 feet. This represents 108 trees to the acre, and it has practically become a standard.

To find the number of trees necessary to plant an acre of land, bring one acre to square feet, and divide by the square of the distance allowed, thus—

$$\frac{4 \times 40 \times 30\frac{1}{4} \times 9}{20 \times 20} = \frac{1089}{10} \text{ or } 108\tfrac{9}{10} \text{ trees.}$$

The same method of working the 18 feet by 18 feet principle gives $\frac{1210}{9}$ or $134\frac{4}{9}$ trees per acre.

To find the lowest number, without a fraction, of trees necessary to plant the smallest number of acres at 20 feet by 20 feet, let the numerator (1089) of the improper fraction represent the trees and

the denominator (10) the number of acres. Thus, 1,089 trees will plant 10 acres, and in the case of the 18 by 18 system, 1,210 trees will plant 9 acres.

FINDING THE RIGHT ANGLE.

When preparing to plant, the usual practice is to make a square with which to set out the right angle. Plate 8 shows method of constructing same on the 3, 4, and 5 principle. Secure three pieces of ordinary flooring boards 6 inches by 1 inch. One should be a 21-ft.

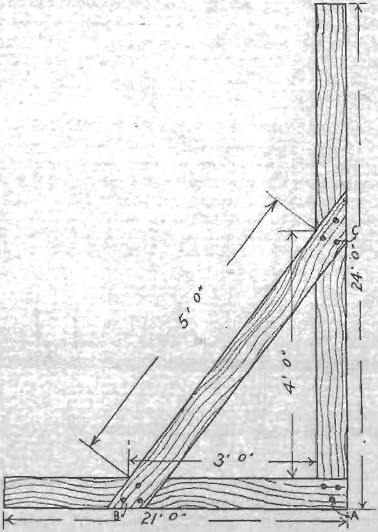


Plate 8.—To make a square for right angle.

length for the base, another 24-ft. to form the right angle, and a 7-ft. length for the diagonal. Place the base on the right-angle piece and put in screw (A). Measure 3 feet on the base, place diagonal as shown, and insert screw (B). Then measure 4 feet on the right angle and 5 feet on the diagonal as depicted, bring right-angle board and diagonal into position, and drive in screw (C). The remaining six screws may be placed in the square as shown. Provided the work is properly executed, the square will be correct.

An ordinary fencing wire, No. 8 or 10 gauge, and of sufficient length to measure the longest row of pegs in the orchard, is used in conjunction with the square to find the right angle and locate the positions of the pegs, which indicate where the trees are to be planted.

The wire is marked by soldering on a piece of finer wire at every 20 feet, or whatever distance is allowed between the trees. A loop is made at each end, about 5 feet from the end marks, into which two iron pegs or crowbars are placed to hold the wire, when fixed in position.

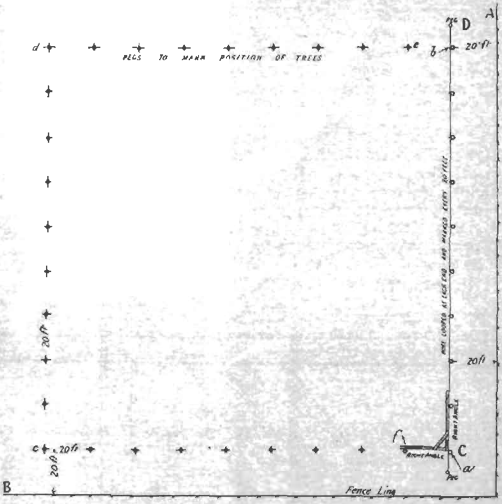


Plate 9.—Setting out the Orchard.

Plate 9 illustrates method of planting 100 trees 20 feet by 20 feet.

Peg (*a*) is put in 20 feet from (A) and (B) fence lines respectively. Then the wire (C D) is stretched to form the base line, the end mark on the wire is placed at (*a*), on the inside of the peg, and made fast by the iron pegs; when 20 feet has been measured from (B) fence line to (*c*), the row of pegs are then driven in. The wire is then removed to the position shown in the diagram, peg (*b*) is put in, and the right angle is formed by using the square as depicted. When pegs (*a*) to (*b*) are driven in the wire is removed to (*b d*), but before driving in (*d*) test with wire (*c*) to (*d*). When the proper

position for (*d*) has been found, put in the two rows of pegs. A square is then formed and the wire removed (*f*) (*e*), and when this row is filled in the remaining ones may be dealt with similarly.

Whenever the fence lines (A B) describe a true right angle no square is required; simply allow 20 feet for the headlands, and distance between the trees may be found by using the wire.

Plate 10 shows method of finding a right angle without using the square, and when there are no fence lines to describe it. This is based on the 3, 4, and 5 principle on which the square is constructed.

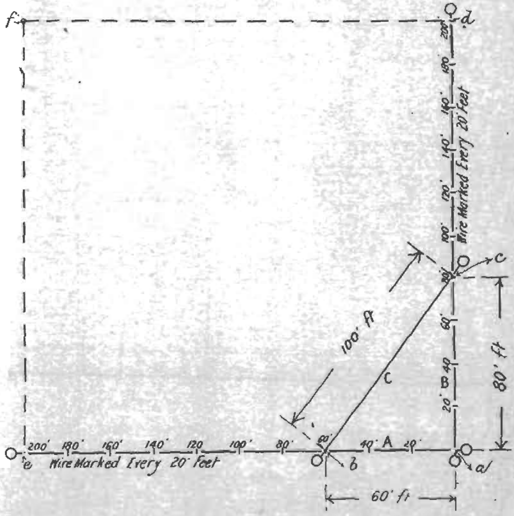


Plate 10.—Method of finding a right angle without using a square.

But a multiple of these numbers may be used in order to obtain greater accuracy. In this case the multiple of 20 increases the base (A), the right angle (B), and the diagonal (C) to 60, 80, and 100 feet respectively. The higher the multiple used the more accurate will be the right angle.

To set out the right angle as illustrated stretch the wire from (*a*) to (*e*) and put in the row of pegs. Then remove the wire to (*a*) (*d*), but before making it fast at (*d*) measure 100 feet from the fourth peg (*b*) on the base to the fifth mark (*c*) on the right angle wire. When the points (*a*, *b*, and *c*) coincide as shown, make the wire fast

at (*d*). To complete the square for 100 pegs by finding the position of (*f*) and finish the pegging out, follow the directions given in connexion with Plate 9.

On account of its rapidity, simplicity, and accuracy, this is the method recommended for setting out the right angle.

Whether the method of finding the right angle and the positions of the pegs as illustrated in Plate 9 or 10 is adopted, the positions of the pegs in relation to the lines described by the wire should be uniform.

To illustrate this Plate 11 shows sixteen pegs in position. The corner one (A) is the first used, and consequently it may be regarded as the key to planting the whole orchard. The position it takes up is the most convenient in which it can be placed in relation to the

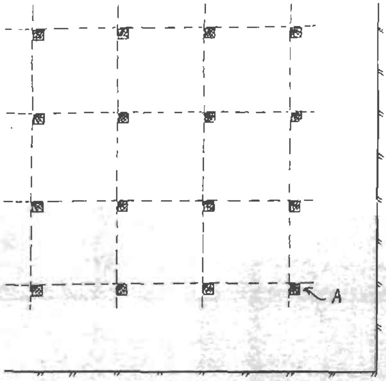


Plate 11.—Position of pegs in relation to the lines.

dotted lines, which represent those marked out by the planting wire, and the others occupy corresponding positions.

Wide headlands are advocated. They should be 20 feet, which is also recommended as the distance between the trees.

Planting in Depressions and on Elevations.

When depressions and elevations exist in the area to be planted Plate 12 illustrates, in order to obtain straight rows of trees, how these difficulties may be overcome, and the pegs placed in their proper places. Fig. 1 is the cross section of a depression over which the wire may be stretched in the usual manner from (*d*) to (*a*). Then the pegs (*d c*) are placed in position. A plumb line held at mark (*f*) on the wire will find that peg's position. Those between (*f*) and (*e*)

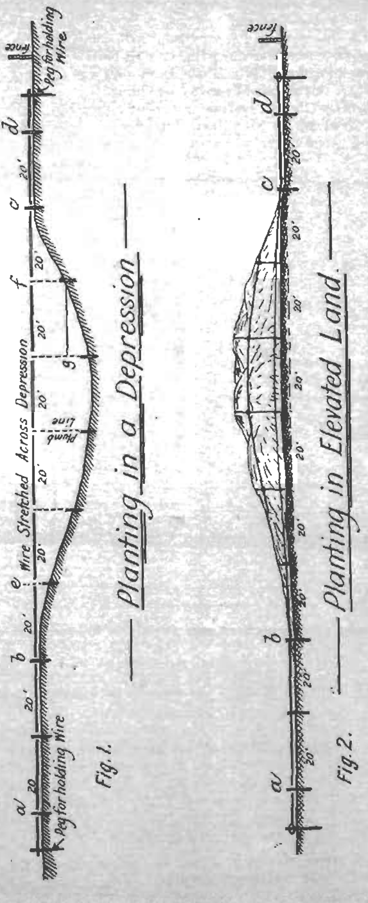


Fig. 12.—Planting in depressions and on elevated land.

may be arranged similarly. The pegs (*b*) to (*a*) being on the level are fixed in the usual manner.

Should the depression be too deep to permit of the plumb line being held to the marks on the wire, it may be stretched on the surface to describe a straight line. A 20-ft. measuring rod may be placed *against peg (f) and plumbed at (g) as shown.*

Plate 12, Fig. 2, is section showing elevation and illustrating simple method of pegging out the land under these conditions. All the level land around the elevated portion is first pegged out in the

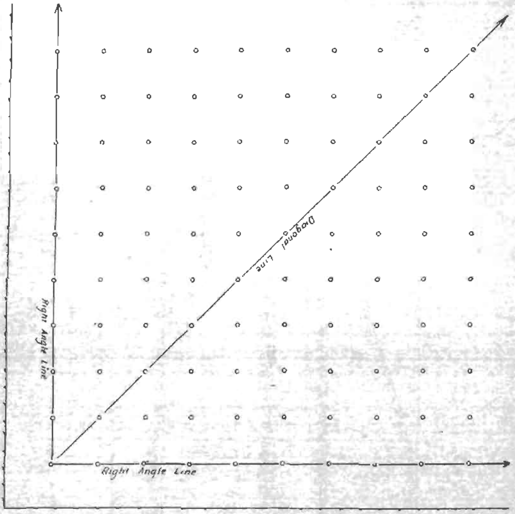


Plate 13.—Using the diagonal line as a check on the right angle.

ordinary way (*d c*) and (*b*) to (*a*), &c. When this is completed, two ordinary wires are drawn across each other, at right angles on the elevation and from corresponding pegs at each end of the wires. Where they cross each other marks the position of the pegs. Or the elevation may be pegged out as shown (*g, f, c*, Fig. 1).

POSITIONS OF TREES FOUND.

The rows of small circles in Plate 13 indicate the positions of 100 trees. The method of finding those positions is illustrated in Plates 9

and 10, and explained. Almost any number of acres in one orchard block may be worked in similarly.

It frequently happens that prospective fruit-growers, without previous knowledge of the work, and with limited capital, after selecting their land, usually clear and plant a few acres each year until the orchard area is completed.

When commencing to plant an orchard in this manner particularly, the north-east corner, preferably, should be made the base of operations, situation and general conditions permitting.

When an orchard has been started, on the lines laid down in these illustrations, it becomes a simple matter to continue the desired yearly extensions to the planted area.

This may be accomplished by using the planting wire to maintain straight right-angle lines in the direction to which the arrows point in Plate 13, using the diagonal line as a check on the right angles.

Positions of Trees found by Sighting.

Occasionally planters adopt the old method of "sighting" their trees into position. This is done by planting a tree in the right-angle corner in which operations are commenced. A peg is put in at the opposite end of the row, then a measuring rod is used to determine the distance between the first and second tree, a sight is taken from the first tree to the peg, and the second tree is planted in line, and so on until the row is planted. The remaining rows are worked in in like manner. But the planting cannot be so accurately done under the sighting process as it may be by using the planting wire.

It frequently happens that the rows which run at right angles to those sighted do not run in straight lines. Therefore, this method is more tedious, costly, and less accurate than the one advocated.

When all the essential details in connexion with laying out an orchard on sound commercial lines receive attention, at the proper time, the orchard becomes an object for prospective planters to emulate, a credit to the district in which it is situated, and a great attraction for intending purchasers, if the owner wishes to sell.

Diagonal Planting.

Although the square system of planting is recommended and mostly practised by our fruit-growers on account of its general suitability to the requirements essential to the thorough working of the orchard in relation to cultivation, drainage, irrigation, &c., certain local conditions occasionally occur in undulating districts, when the diagonal planting method has its advantages in respect to the requirements mentioned.

When orchards are planted on those hilly lands, irrigation from dams is the method invariably practised. When laying out the orchard, therefore, the lay of the land should be regarded as an important factor when determining the method of planting to be adopted.

The diagonal system consists mainly of running the rows of trees from corner to corner of the orchard or in diagonal lines from the headlands.

Plate 14 shows the diagonal system of planting and its suitability for cultivation and irrigation, &c., under certain circumstances.

To determine the positions for the pegs 20 feet is measured off for the headlands. Should the fence lines not describe a right angle, it may be found as previously described. When this is done the square may be completed, and the diagonal line found with the planting wire, and the row of pegs placed in position. The pegging out of the whole area may be completed by placing lines of pegs at right angles, or parallel to the diagonal line as depicted in the illustration.

In order to understand why the method of planting under review is advocated when local conditions require it, and for the reasons already explained, assume that a ridge runs in the direction of the

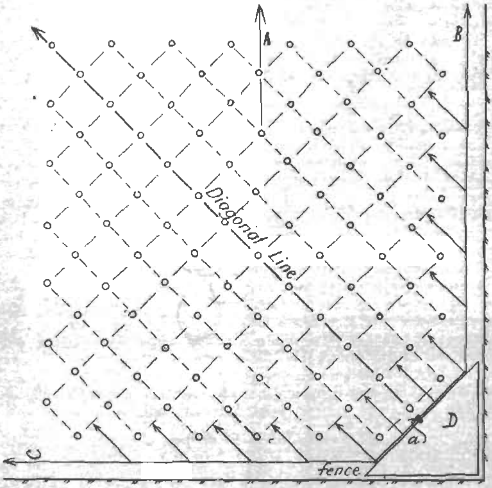


Plate 14.—Diagonal planting.

diagonal line, and that the land slopes abruptly from the ridge on both sides. It will be seen that the trees run in rows parallel to the ridge. This facilitates ploughing, spraying, &c., in that direction. And suppose the dam (D) to be on the highest point of the ridge. The water escapes at the vent (*a*) and is carried in the small drains (B) and (C) down the headlands. The small arrows denote the points at which the water may be diverted from the drains and directed amongst the rows of trees.

Now assume that the ridge runs in the direction to which the arrow (A) points and that the dam is on the highest point in line with it. Then it will be observed that, under these conditions, the square method

of planting would best suit the requirements, and for reasons similar to those advanced in favour of the diagonal method, when adopted advantageously.

Generally speaking, when establishing an orchard in a locality in which serious irregular undulations exist in the area to be planted, work to the contour, as nearly as circumstances will permit, by placing the rows of trees parallel to the ridges.

STAKES AND PEGS.

When the young trees are being planted out in their permanent positions in the orchard, particularly on exposed situations and when their roots are hard pruned, the use of stakes to support them is recommended. By this means they are enabled to maintain their upright positions until such time as the root systems are thoroughly estab-

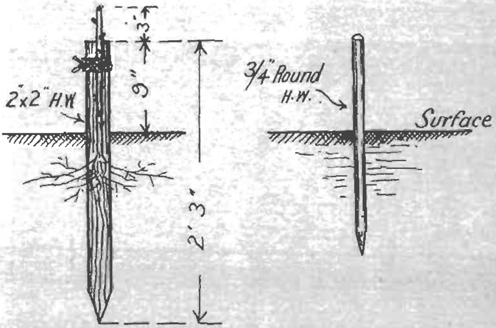


Fig. 1. Fig. 2.

Plate 15.—Stakes and pegs for trees.

lished and thriftiness insured. When the stakes are not employed for the purpose mentioned, the wind causes the trees to wobble, and the young roots are frequently broken off on the side on which the wind strikes, causing the trees to lean to the opposite direction. It often proves a difficult proposition to remedy this defect.

When the stakes are used and the trees securely fastened to them, the root systems become established without interruption. This not only insures the trees' uprightness and future stability, but also permits of more extended root areas being operated upon to supply the sap requirements of the trees.

Trees with short stems, from 12 to 15 inches, are recommended, and particularly when the orchard is in an exposed situation. The tree should be planted to the same depth at which it grew in the nursery row.

Plate 15, Fig. 1, depicts stake, tree with three buds, from which the branch system is formed, projecting above top of stake, and method of tying. The relative positions of sixteen stakes of this kind are shown in Plate 11.

The stakes are made from 2-in. by 2-in. hardwood 2 ft. 3 in. long, and pointed as shown in the diagram, with 1 ft. 6 in. driven into the ground and 9 inches above the surface. Stakes 6 inches longer should be provided for use in loose sandy soils or on land where subsoiling operations have been carried out.

The trees should not be cut to the desired length prior to being planted, as the buds which are required to form the branch systems may be accidentally destroyed during planting operations. To secure the tree to the stake, procure a strip of hessian 2 feet long and 2 inches wide. Take one turn with the hessian first around the stake and then two turns around the tree and stake, then tie a piece of soft twine on the hessian to keep it in position as shown in the illustration.

If the tree is planted on the side of the stake facing south, the stem will be somewhat shaded from the sun and hot northerly winds, which frequently cause hardness of the bark, and often impede its development.

When stakes are not employed, pegs made from ¾-in. round hardwood about 1 ft. 6 in. long, as shown in Plate 15, Fig. 2, may be used to mark the positions of the trees. They are removed when the trees are being planted with the planting board.

(To be continued.)

ABRAHAM LINCOLN had a good notion of intensive cultivation. "More brain, less sweat," was his view on the matter. "How foolish," he remarked, "to walk over 40 acres when an equal crop can be raised from 10 acres by intensive cultivation."

As an instance of what irrigation can do, the example of Mildura may be cited. On an area of 12,000 acres, an inland community of 6,000 souls, enjoying a high standard of comfort, is maintained. The annual value of Mildura's products is no less than £450,000.

How the war affects America as regards potash salts—shipments to America, August, 1914, 50,000 tons; shipments, August, 1915, 500 tons. A big nitrate of soda concern during the past twelve months made a gross profit of only £8,000 against about £80,000 for the previous year.

WHEN taking cows to or from pasture, or, for the matter of that, anywhere, never hurry them, but allow them to walk at their own natural pace, and do not shout and holloa and kick up a row generally, as though you had a crowd of wild and savage beasts to deal with.

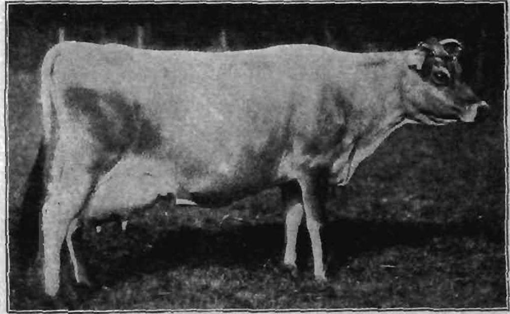
HERD TESTING.

Fourth Annual Report on the Testing of Pedigree Herds Conducted by the Department of Agriculture, Victoria, for year ended 30th June, 1916.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer, and E. T. Archer, Senior Dairy Inspector.

Although there is a small reduction in the number of herds tested in the fourth year of operations, it may be claimed that the scheme is not decreasing in interest and value. Two new herds have entered the ranks, and many more are promised for the coming year, when the effects of the drought have passed away—the reduction in the total number is due to the inability of some of the breeders to obtain sufficient

Blood will tell, No. 1.

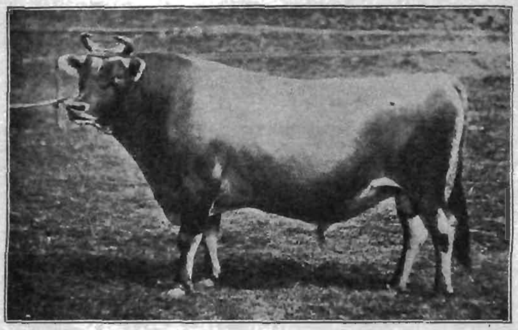


Lady Viola, dam of Noble of Oaklands.

fodder during the drought to even keep their herds in milk. In 1914-15 21 herds were tested; in 1915-16 only 16. Two herds dropped out by reason of dispersal sales, the balance by reason of drought and its consequent losses. It is anticipated that these latter will re-enter at an early date.

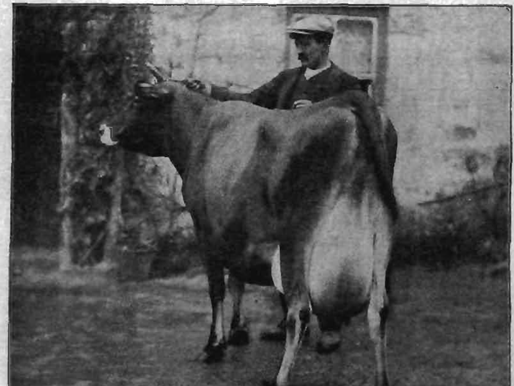
The object of the test must always be kept before the minds of breeders and dairymen generally. In no case must it be thought that extraordinary records are aimed at—rather are they discouraged for such are no indication of the merit of a herd. The main object is to work improvement in our stud stock, and by discovering strains of cattle which, when properly fed, will be a reliable source from which dairy-farmers may with confidence obtain sires as a means of increasing the average return from their cows. At the present time, with the reduced numbers in our herds, the opportunity for the dairy-farmer to build up

Blood will tell, No. 2.



Noble of Oaklands, sire of Pretty Noble.

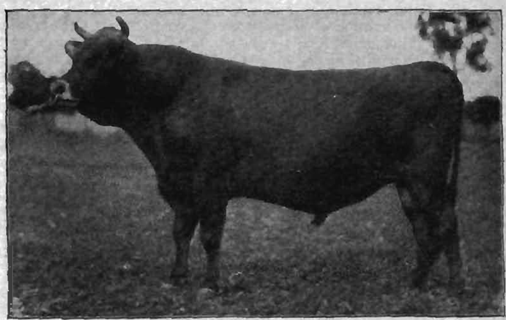
Blood will tell, No. 3.



Boutilliere, dam of Pretty Noble.

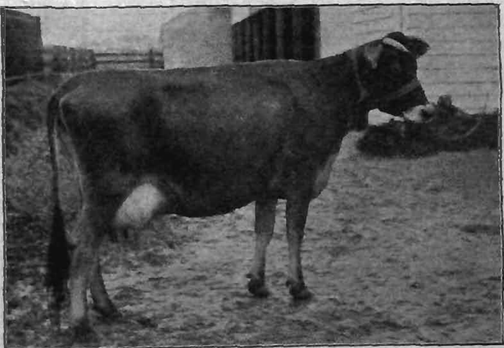
the average of his cows is enormous. Our average return is by no means small compared with other countries, but that they can be still further improved requires no comment. That breeding along right

Blood will tell, No. 4.



Pretty Noble.

Blood will tell, No. 5.



Lassie Fowler IV. of Melrose, by Pretty Noble.

lines will make an improvement is recognised by all. An example, however, of the effect of a sire with good records behind will not be out of place.

In an article in the *Journal* of this Department for July last, Mr. R. R. Kerr wrote—

The Jersey bull "Pretty Noble," imported from the Jersey Islands by Mr. W. Woodmason, has proved himself the sire of very fine heifers, and the yields of the first seven to complete the nine months' test are given, which, for consistency and general ability, would be very hard to beat. It is a matter of satisfaction to know that our breeders, generally speaking, now import only animals having records of butter production. Though they are desirous of securing animals true to type, they realize that production is the main essential.

Name of Heifer.*	Milk.	Test.	Fat.	Butter.	Milk Last Day.	Age at Calving.	Sire of Heifer.
	lbs.		lbs.	lbs.	lbs.		
Lassie Fowler IV. of Melrose (467)	5,977	5·69	340·32	388	15½	2 years 1 month	Pretty Noble (imp.)
Chevy VIII. of Melrose	6,011	5·63	338·56	387·75	19	2 years 3 months	Pretty Noble (imp.)
Empire V. of Melrose	5,661	5·42	307·08	350	15	2 years ..	Pretty Noble (imp.)
Jessie XII. of Melrose	5,063	5·99	303·25	345·5	16	1 year 11 months	Pretty Noble (imp.)
Edith II. of Melrose	5,418	5·48	296·69	338·25	14	2 years 6 months	Pretty Noble (imp.)
Pleasance V. of Melrose	4,859	5·1	277·57	316·5	13½	2 years 1 month	Pretty Noble (imp.)
Graceful Duchess XI. of Melrose	4,470	6·02	269·29	306·98	14½	1 year 8 months	Pretty Noble (imp.)
Average ..	5,351·2	5·60	304·68	347·33	15·6	24·8 months	

* The names are now given as accepted for Herd Book.

The dam of this bull, "Bontilliere," has had a wonderful record, her last obtained at 12 years of age being 12,103 lbs. milk, yielding 798¾ lbs. of butter. She is a winner of many show ring prizes and butter contests—her photo. shows her to be a typical specimen. "Pretty Noble" is by "Noble of Oaklands," sold in America for £3,000, another specimen typical of the breed, and full of dairy qualities, inherited in turn from his dam, "Lady Viola," who had a wonderful record behind her both in the Show Ring and as a heavy testing cow.

That individual records are not the main object of the test is shown by the regulations under which the same is conducted. For instance, a lactation period of only nine months is taken instead of twelve months as followed in some countries, thus reducing the inducement to keep cows barren during the test, which would tend to increase the individual record. No breeder could afford to keep the whole herd out for the time required if this were done—nine months is taken as the fair period during which a cow milks, allowing her time to dry off and recuperate for the following season. To give an idea of her staying properties, the amount of milk given on the last day of the nine months is recorded, and a common basis is established upon which comparison may be made. In the same way butter fat production is taken. Nearly all countries of the world have now adopted this base, for no comparison can be made

when commercial butter is the term used to denote returns; in this regard it is to be regretted that the breeders of New South Wales have not adopted this most equitable method of computation.

It is somewhat early as yet to take returns of cows in Victoria to show the improvement of a herd by reason of testing, but the following example of the herd of Mr. August Kinch, in Sweden, is highly instructive:—

RESULT OF TEN YEARS' TESTING IN THE HERD OF MR. AUGUST KINCH, AT BELTABERGA, SWEDEN.

Testing Period—365 Days.	Average Number of Cows in Herd.	Average Milk Per Cow. lbs.	Average Fat Test of Herd. per cent.	Average lbs. Butter Fat per Cow.	Cost to produce 100 lbs. Milk.
					s. d.
1899–1900	70	7,320	3·05	223·26	3 7
1900–1901	28	7,905	3·13	247·42	3 8
1901–2	46	9,003	3·20	288·09	3 1
1902–3	55	9,984	3·18	317·49	2 8½
1903–4	61	10,584	3·22	340·80	2 7½
1904–5	64	11,236	3·22	361·79	2 7½
1905–6	71	11,333	3·21	363·78	2 10½
1906–7	79	11,486	3·18	365·25	2 11
1907–8	77	11,023	3·17	349·42	3 0
1908–9	79	11,399	3·34	380·62	2 10½
		+4,079	+0·29	+157·36	−0 10½

Increase (+); Decrease (−).

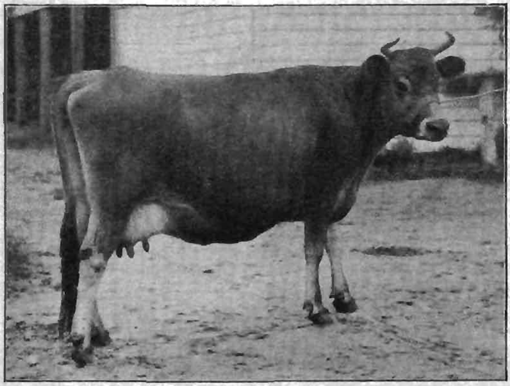
The original herd of 70 was reduced to 28. The others were proved unprofitable and sold. The heifers of the 28 were reared and added to the herd. In ten years the herd average had increased by 400 gallons of milk and 157 lbs. of butter fat, which, at 1s., represents an increase of £7 17s. per cow.

What results may be obtained from a number of herds is shown in the following table covering a period of ten years:—

RECORD OF A SWEDISH COW-TESTING ASSOCIATION FOR TEN YEARS.

—	Average Milk Yield per Cow.	Average Fat Test.	Average lbs. Butter Fat per Cow.
1st year	6,890	3·11	214·27
2nd ,, ...	6,582	3·11	204·70
3rd ,, ...	7,357	3·16	232·48
4th ,, ...	7,692	3·17	243·83
5th ,, ...	7,653	3·04	232·65
6th ,, ...	8,269	3·04	251·37
7th ,, ...	9,155	3·05	279·22
8th ,, ...	9,338	3–15	294·14
9th ,, ...	9,183	3·15	289·26
10th ,, ...	10,064	3·12	313·89
Increase	3,174	..	109·62

The result of ten years' operations was to increase the average milk yield by 317 gallons, and butter fat 109 lbs., while the butter-fat test remained about the same. This is low compared with the average test in the herds in this country, and would indicate that we would have nothing to gain by the introduction of their breeds of cattle. If their methods of management and feeding were more largely adopted here our results would compare very favorably with those of other countries.



Jessie VI. of Melrose (on completion of test), 1st in Order of Merit, 1916 (250 lbs. standard).

Winner Annual Champion Prize. Owner, Mr. W. Woodmason.

—	Lbs. of Milk.	Test.	Butter Fat (lbs.)	Standard (lbs.)	Milk Last Day (lbs.)	Days in Milk.
1915	7,924¼	6·71	532·17	250	21¼	273
1916	8,342	6·27	523·34	250	13½	273

In Denmark the improvement of milk yield due to system of records adopted is shown by the following figures:—

1844—average yield per cow	1,650 lbs.
1864—average yield per cow	2,500 lbs.
1884—average yield per cow	3,300 lbs.
1894—average yield per cow	4,850 lbs.
1911—average yield per cow	6,150 lbs.

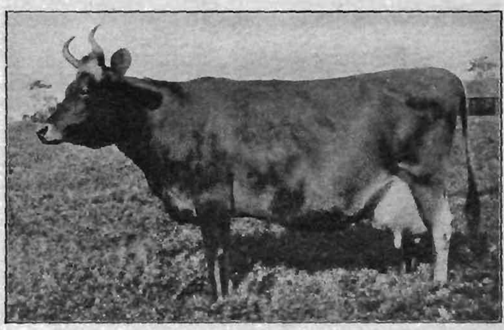
In 1908, as against 1884, the average yield of butter had exactly doubled, and was 224 lbs.

SCOTTISH RECORD.

Professor Alexander Laurie, D.Sc., writes in regard to testing in Scotland—

In Scotland the work is carried on through local societies, consisting of 20 to 24 members, so that the work of each society is sufficient to take up the whole time of a recorder. The weighing and testing may be

done every 14, 21, or 28 days, an interval of 21 days being most common. The recorder arrives at the farm in the afternoon, weighs, and determines the percentage of fat in the evening milk and the morning's milk next day. All the testing and weighing is done by the recorder, the farmer being only asked to supply details as to feeding, times of calving, &c. A copy of the record is left with the farmer, and a copy forwarded to the Central Committee.



Lady Grey V., 2nd in Order of Merit 1916 (250 lbs. standard).

Winner Annual Reserve Champion Prize. Owner, Mr. A. W. Jones.

—	Lbs. of Milk.	Test.	Butter Fat (lbs.)	Standard (lbs.)	Milk Last Day (lbs.)	Days in Milk.
1914	5,437¾	5·62	305·87	175	12	259
1915	8,323¼	5·61	466·93	200	20	273
1916	9,615	5·11	491·59	250	33	273

In six or eight years the average annual milk yield has been increased by 100 *to* 200 gallons per cow. The increase in the value since the beginning of the scheme, of pedigreed (milk record) Ayrshires for export purposes is estimated at about 50 per cent.

There have not been sufficient sales conducted in Victoria as yet from which to learn to what extent testing adds to the value of a cow, but in the University of Illinois, where certain information has been accumulated, it was found in respect of five different sales that—

	£	s.	d.
187 cows without records averaged	£57	10	0
171 cows with records averaged	93	0	0
showing increased value due to record	£35	10	0

Amongst heifers—

	£	s.	d.
184 heifers from dams without record averaged	£42	0	0
133 heifers from dams with record averaged	£68	10	0

showing a value of £26 10s. for the dam's record before the progeny came into profit.

Before entering upon the records in Victoria during the past year, let us look at some of those obtained in other countries.

Tasmania.

In Tasmania, the testing period covers only six months, and part of a herd only may be tested. Whilst the information thus gained is valuable, it encourages individual records by allowing only the best of the herd to enter and forcing for six months. The standard required is 200 lbs. butter fat and 4,000 lbs. milk. At a recent conference of dairymen it was reported that there were 17 Ayrshires in the register, as under:—

—	Lbs. Fat.	Lbs. Milk.	Average Test.
Jewel Queen of Gowrie Park	297·12	7,785	4·1
Princess	282·81	5,580	5·0
Hawthorn	273·11	6,090	4·4
Shamrock	261·10	5,640	4·6
Bonnie Jean	256·65	5,970	4·3
Lilac	253·52	6,150	4·1
Lessnessock's Favourite	249·03	6,450	3·7
Soncey	246·24	4,950	4·9
Fancy	234·81	5,250	4·5
Bonnie, Favourite of Gowrie Park ..	228·88	6,165	3·7
Lily	223·83	5,880	3·8
Dairymaid	223·14	4,590	4·8
Fan	212·64	5,010	4·2
Royal Dewdrop	209·19	4,755	4·4
Ruby	209·03	4,590	4·4
Belle	203·64	4,290	4·7
Maggie	202·26	5,310	3·8

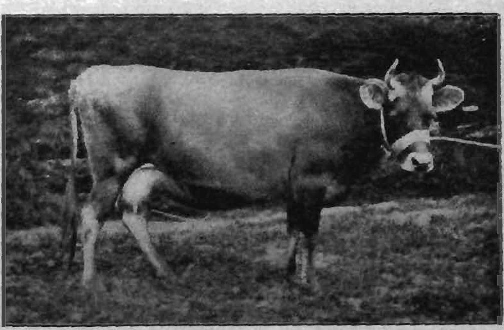
There were ten Jerseys entered in the advanced registry of the *Tasmanian Jersey Herd Book.* The average production of these cows was, for the six months, 244 lbs. fat and 4,815 lbs. milk; average test, 5 per cent. The following are the cows in order of their production of butter fat:—

—	Lbs. Fat.	Lbs. Milk.	Average Test.
Roi	289·14	4,965	5·8
Sylvan	279·66	5,850	4·8
Meg, 1915	271·23	6,030	4·5
Niwa	266·07	5,100	5·3
Daphne	244·41	4,360	5·5
Violet	241·98	4,740	5·1
Ruby	239·46	4,620	5·1
Gay	232·41	4,275	5·4
Meg, 1914	214·77	4,385	4·9
Lil	202·65	4,140	4·9
Topsy	202·47	4,500	4·5

Parrakeet, 1st in Order of Merit 1916 (200 lbs. standard).

Owner, Mr. C. Gordon Lyon.

—	Lbs. of Milk.	Test.	Butter Fat (lbs.)	Standard (lbs.)	Milk Last Day (lbs.)	Days in Milk.
1915	7,287	4·70	342·65	175	18	273
1916	9,827	4·47	438·90	200	20	273



Lady Grey 1st of St. Albans, 1st in Order of Merit 1916 (175 lbs. standard).

Owner, Mr. A. W. Jones.

—	Lbs. of Milk.	Test.	Butter Fat (lbs.)	Standard (lbs.)	Milk Last Day (lbs.)	Days in Milk.
1916	5,255	6·61	347·30	175	17½	273

New Zealand.

The New Zealand Jersey Cattle Breeders' Association's annual report for 1915-16 shows that during the past year 97 cows have been awarded certificates by the New Zealand Department of Agriculture as the result of the semi-official test conducted by that Department. The average production of these 97 cows was as follows:—

—	Days in Milk.	Average lbs. of Milk.	Average Test.	Average lbs. Butter Fat.	Average lbs. Milk per Day.	Average lbs of Butter Fat per Day.
42 Two-year olds ..	344	6,538·6	5·611	366·94	19·0	1·07
22 Three-year olds ..	354	7,686·47	5·812	446·81	21·71	1·262
14 Four-year olds ..	335	8,459·11	5·410	457·58	25·22	1·365
19 Mature	348	7,796·44	5·511	484·84	25·27	1·393
97 Cows (average) ..	345	7,518·75	5·604	421·35	21·79	1·224

"Madam Mayflower," semi-official record of 11,793.2 lbs. of milk and 763.41 lbs. of butter-fat in 365 days, is claimed as a Jersey record for the Southern Hemisphere.

It may be noted that the above records cover a period averaging 345 days.

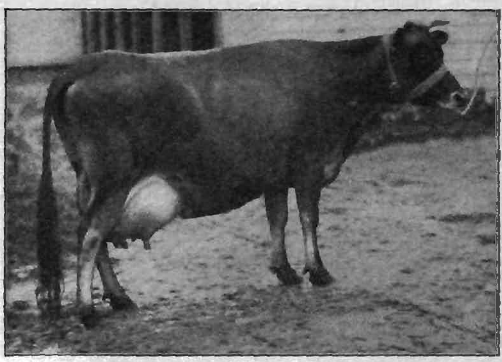
Canada.

The average milk production of cows in Canada, according to official files, is 3,800 lbs., and of butter fat 150 lbs. per annum.

In 1913 the number of cows tested in the Canadian herd test was 4,852, giving an average return for the full lactation period of 5,856 lbs. milk, with an average test of 3.4, and butter fat 201 lbs. The best records obtained are shown hereunder:—

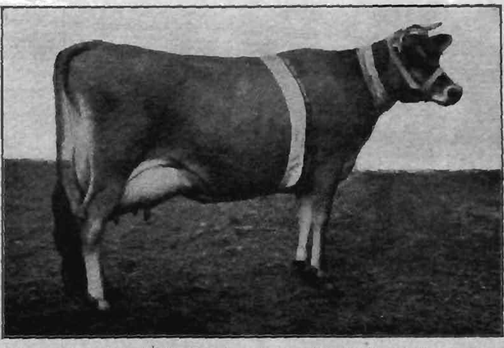
Breed.	Name of Cow.	Age.	Lbs. of Milk.	Per cent. Fat.	Lbs. Fat.
Hosltein ..	Duchess Skylark Ormsby	Mature	27,761	4·3	1,205·09
,, ..	Tilly Alcarta	,,	30,452	3·1	951·30
Jersey ..	Sophy 19th of Hood Farm	,,	17,557	5·6	999·2
Guernsey ..	Murne Cowan	,,	24,008	4·5	1,098·1
Ayrshire ..	Auchenbrain Brown Kate 4th	,,	23,022	3·9	917·60
French-Canadian	Fille	,,	10,767	4·2	453

The highest records for Shorthorns are 13,535 lbs. milk, 540 lbs. fat, and 11,578 lbs. milk, 534 lbs. fat.



Lassie Fowler III. of Melrose. Owner, Mr. W. Woodmason.

—	Lbs. of Milk.	Test.	Butter Fat (lbs.)	Standard (lbs.)	Milk Last Day (lbs.)	Days in Test.
1915	7,287¼	5·83	425·0	250	22	273
1916	8,121	5·49	446·29	250	23	273



Sweetbread 24th (imp.). Owner, Mr. C. D. Lloyd.

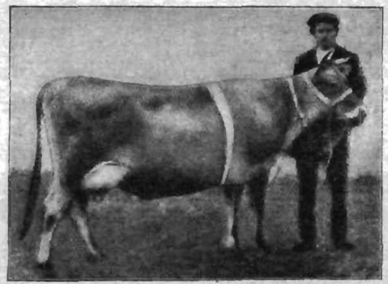
—	Lbs. of Milk.	Test.	Butter Fat (lbs.)	Standard (lbs.)	Milk Last Day (lbs.)	Days in Test.
1914	8,421	5·84	492·10	250	24	273
1915	8,504	5·67	482·26	250	17	273
1916	8,484	5·33	452·42	250	16	273

United States of America.

The conditions under which some of the testing is done in United States of America will be of interest. The following are the Rules and Regulations of the Advanced Register of the Holstein Friesian Society:—

All tests are conducted by representatives of the State Agricultural Colleges, *i.e.*, supervisors. Fees are fixed by the State colleges for conducting the test. Some charge £5 for a seven days' test, with 12s. 6d. a day for extra time. New York charges 10s. a day for time actually occupied in test with 4s. 2d. extra for each cow that qualifies.

In a seven days' test the supervisor must see the cow milked dry on the last milking prior to commencement of test, and carefully note the hour, so that the last milking of the test shall be done at exactly the same hour. Only one cow may be milked at a time, so that the milk can be kept under close scrutiny. It is recommended that a supervisor shall have only six cows at one time. Samples are taken by pouring the milk from one pail to another or by a dipper.



Mythic. Owner, Mr. C. G. Knight.

—	Lbs. of Milk.	Test.	Butter Fat (lbs.)	Standard (lbs.)	Milk Last Day (lbs.)	Days in Test.
1915	6,031	5·25	316·58	250	4½	253
1916	7,096¼	5·09	361·27	250	14½	273

Tests are made in duplicate, and the fat is shown in three decimals. If the fourth figure is 5 or greater, it is counted 1, if less than 5 it is dropped.

Tests are made by the supervisors on the farm and composite sample is taken, *i.e.*, with a pipette the same number of cubic centimetres as lbs. of milk into a jar from each milking, with a preservative. This is tested at the college as a check on the individual test. Subject to all conditions imposed by the rules of this association, State Agricultural Colleges may supervise the tests made by cows in their own herds; but no test made by any cow owned by such institution, that is made under the supervision of its own officers, shall be eligible to compete for any prize that may be offered by this association.

An official test may cover any number of consecutive days.

No official test shall be accepted that is begun earlier in the lactation period than the morning of the seventh day after calving.

Semi-official yearly test or lactation test is taken, on two consecutive days each month, beginning not earlier than fourth day after calving, continuing during the lactation period or such consecutive part of it, as the owner may desire, but not exceeding 365 days in length. Not less than three different supervisors shall be employed in a semi-official test, and no supervisor should conduct the test in two successive months Only official tests are accepted for Advanced Register, but semi-official records are credited when the cow has been accepted for Advanced Register.

In Illinois, the highest records of the different breeds are as follows:—

Name.	Milk.	Test.	Fat.
	lbs.		lbs.
Jersey—Jacoba Irene	17,253	5·51	952·0
Holstein Friesian—Pietertje Lass Aggie Netherland 2nd	20,165·4	3·27	660·70
Guernsey—Dolly Bloom of Langwatter	12,024·5	5·25	632·34
Brown Swiss—Belle Windsor	10,959·8	4·15	455·08

These records are for 365 days.

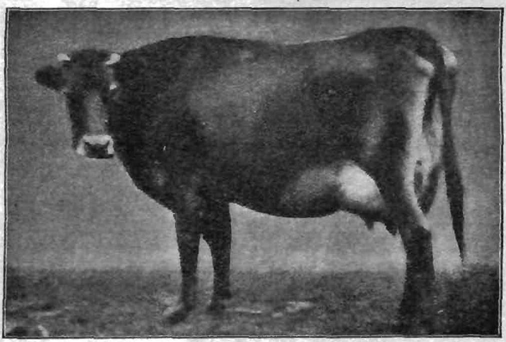
They claim Jacoba Irene's as the highest record ever made by a Jersey cow. The following are her records for four years:—

—	Milk.	Fat.
	lbs.	lbs.
Year ending in 1906	11,391	619
,, ,, 1907	14,255	792
,, ,, 1908	17,253	952
,, ,, 1910	12,001	667·8

It will be noticed that she missed 1909. The inference is she was not in calf when she made her best record.

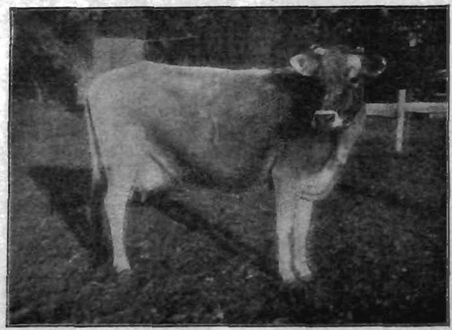
Amongst Ayrshires in the Advanced Register it is seen that the average return is as under for a year's test:—

—	Milk.	Test.	Fat.
	lbs.		lbs.
Average for 2 year old	8,719	40·5	353·06
,, ,, 3 ,, ...	10,079	3·78	381·26
,, ,, 4 ,, ...	10,560	4·02	424·10
,, ,, mature	10,977	3·83	420·62
Average for whole	9,888	3·95	390·22



Princess of Springhurst. Owner, Mr. J. D. Read.

—		Lbs. of Milk.		Test.		Butter Fat (lbs.)		Standard (lbs.)		Milk Last Day (lbs.)		Days in Milk.
1914	..	6,228¾	..	6·14	..	382·33	..	250	..	18¼	..	273
1915	..	6,291	..	5·87	..	369·11	..	250	..	7½	..	273
1916	..	5,869	..	6·05	..	355·28	..	250	..	8¼	..	273



Arcardia. Owner, Mr. C. G. Knight.

—		Lbs. of Milk.		Test.		Butter Fat (lbs.)		Standard (lbs.)		Milk Last Day (lbs.)		Days in Milk.
1915	..	4,842¼	..	5·49	..	265·9	..	250	..	9	..	273
1916	..	6,955½	..	5·31	..	369·55	..	250	..	16½	..	273

Victoria may well be proud, therefore, of some of the records already established for this breed amongst the Gowrie Park herd in 273 days' record.

—	Milk.	Test.	Fat.
	lbs.		lbs.
Moonlight	10,079	4·95	499
Linda	13,401	4·78	640½
Laura IV.	10,764	5·28	509
Ida	11,917	5·08	605
Honey	12,655	4·41	558
Blossom	10,601	4·94	524
Scottish Queen	12,022	4·87	585
Pretty	11,196	4·42	495

New South Wales.

In the June issue of the *Agricultural Gazette* of New South Wales appears the records of 57 cows, who have completed their nine months' test; those giving a yield of more than 380 lbs. of butter are reproduced:—

Name.	Yield, Nine Months.		Yield, last Day.	
	Milk.	Butter.	Milk.	Butter.
	lbs.	lbs.	lbs.	lbs.
Pretty May	7,360	471	18·5	1·18
Bertha of Eumaralla	6,784	459	20	1·29
Susie VI.	6,823	459	17·5	1·34
Daisy VI.	7,254	454	28	1·95
Silvery	6,757	451	16	1·07
Daisy IV.	6,604	447	12	1·01
Kenta's Twilish	6,504	421	12·5	0·84
Silver Bet	6,486	410	14	1·08
Daisy VII.	7,413	404	17	1·03
May Pinora	6,276	400	14	1·01
Princess XIV.	6,582	390	13·5	0·98
Pearl	6,076	389	15·5	1·04
Goulisso 15th	5,727	383	16	1·17

Victoria.

Let us now look at the records that have been obtained during the past year in Victorian herds. Bearing in mind that a portion of the drought period is included, and in all cases, owing to the same cause, the cows were heavily handicapped on entry, they cannot be regarded as other than highly satisfactory, and amongst so many good returns no more than passing notice can be given. The Jerseys are again well to the fore both in the numbers entered and in the returns obtained.

Pride of place is obtained by Mr. W. Woodmason, with "Jessie VI. of Melrose," who gave 8,342 lbs. of milk, and an average test of 6.27, equal

to 523.34 lbs. of butter fat. This cow in the previous year was sixth in order of merit amongst all breeds, but first amongst the Jerseys, giving a slightly higher yield of butter fat on that occasion, 532 lbs. from a smaller yield of milk, viz., 7,924 lbs. A full sister "Jessie IX." comes nineteenth in order of merit, with 418 lbs. butter fat, showing that the strain is good. In gaining this position, and provided she calves again within fifteen months of last calving, Mr. Woodmason wins the Annual Champion Prize offered by the Department for the cow giving the greatest yield of butter fat during the year.

Second in order of merit and winner of the Annual Reserve Champion Prize comes Mr. A. W. Jones, with "Lady Grey V.", having a record of 9.615 lbs. of milk and 491.5 lbs. of butter fat. This cow has been a *persistent performer, giving 305 lbs. butter fat as a heifer when she was*

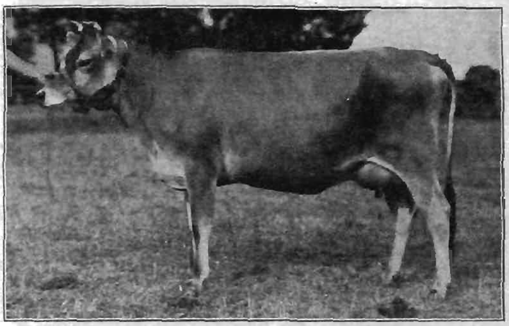
Dainty 6th. Owner, Mr. Trevor Harvey.

—	Lbs. of Milk.	Test.	Butter Fat (lbs.)	Standard (lbs.)	Milk Last Day (lbs.)	Days in Milk.
1916 ..	5,306 ..	5·66 ..	300·33 ..	175 ..	19½ ..	273

sixth in her class, 466.9 lbs. on her second calf when she was third in her class, *and now moves up to second place in the 250-lb. class.* Her full sister, "Lady Grey I.", as is shown later, is first in the heifer class. "Birdseye," *one of the* red polls on the Werribee Research Farm, is third. This cow was sixth in the 200-lb. class in 1914, with 341 lbs. of fat, 22nd in 1915 in the 250-lb. class, and now third with 485.9 lbs. of butter fat.

Two cows that call for more than passing notice are Mr. C. G. Lyon's 16-year-old cow "Noreen," who, with a return of 473 lbs. of fat, gained sixth place in the list; she was fifteenth last year, and third the year before, showing remarkable returns; and Mr. W. Woodmason's "Jessie's Progress," which, with a return of 464 lbs. of butter fat, is seventh in order of merit at the good old age of nineteen years. Only one daughter and one granddaughter of this old cow are in the test in

"Jessie XI.", the daughter, which is twelfth on the list with a return of 430 lbs. of butter fat, and "Wilful Venture," the granddaughter, exempted this year on account of sunstroke, but thirteenth last year with 480 lbs. of fat.



Brownbread. Owner, Mr. C. D. Lloyd.

—	Lbs. of Milk.	Test.	Butter Fat (lbs.)	Standard (lbs.)	Milk Last Day (lbs.)	Days in Milk.
1916	3,936¾	6·32	248·70	175	8	273

Tulip, Princess, Grannie, Nightshade.
Owner, Mr. J. D. Read.

"Sweethread XXIV.," owned by Mr. C. D. Lloyd, is again well to the fore, being ninth with 452 lbs. of butter fat, and one of her heifers, "Creambread," comes fifth in the heifer class with 310 lbs.

Ayrshires are not well represented in this year's operations, only two herds being entered, and both of these suffered severely by reason of the drought.

Amongst the cows under 4 years of age—200-lbs. standard—Mr. C. G. Lyon takes first place with "Parakeet," which yielded 438.9 lbs. of butter fat, passing from sixth in the heifer standard last year.

Mr. Woodmason's "Mystery XIII. of Melrose" comes second, and maintains a high average test of 6.46, being the fifth highest for the year, while a half-sister, "Mystery IX.", comes seventeenth in order of merit, and best of this line in the open class. Mr. A. W. Jones, with "Lady Grey VIII.", is third.

In the heifer class Mr. A. W. Jones scores with "Lady Grey I. of St. Albans," with a return of 347 lbs. of fat, Mr. Woodmason taking the three next positions with "Chevy VIII. of Melrose.," "Jessie XIII.", and "Handsome Girl VII."

The highest average test obtained dnring the year is 6.71. This was obtained by Mr. C. D. Lloyd's "Queen Spark."

HERD PRIZE.

Six herds are eligible to compete for the herd prize donated by the Government, which is offered to herds in which ten or more cows complete their period within the twelve months ended 30th June. This prize is allotted on a handicap basis. In the first place, heifers who have to attain the 175-lb. standard receive a handicap of 75 lbs. of butter fat each.

Those which have to reach 200-lbs. standard receive 50 lbs. each, and every cow in the herd, when the total is above ten, receives ½ lb. of butter fat for each cow. The average for each cow must be 300 lbs. of fat; *thus a herd of ten cows, giving an average of 300 lbs. of fat, would be* beaten by a herd of 30 cows whose average was 286 lbs. of fat. The 30 cows would each receive 15 lbs. handicap, bringing the total to 301 lbs. average, exclusive of handicaps for heifers and second calf cows.

Only four of the herds, eligible by number of cows, are qualified by herd average for the prize, as shown below.

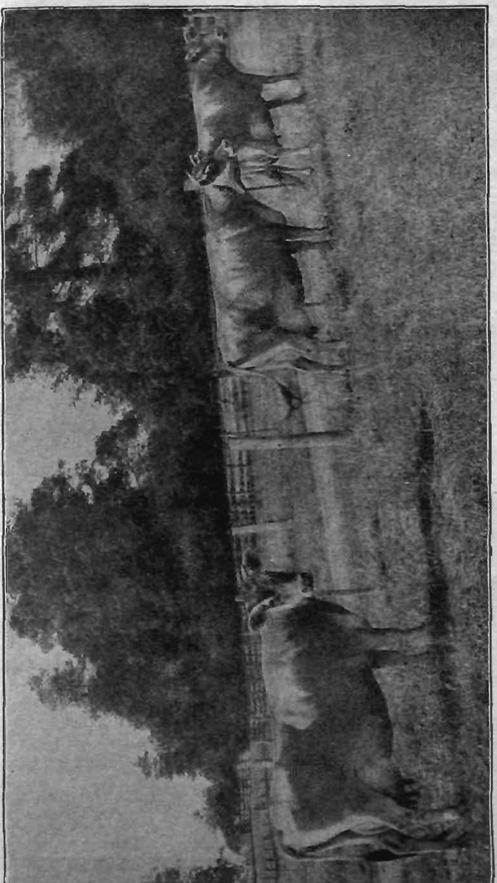
Mr. W. Woodmason's "Melrose" herd takes pride of place with the average return of 403 lbs. of butter fat per cow, including handicap allowances in a herd of 51 cows.

Mr. C. G. Lyon's "Banyule" herd is second with 384 lbs. of fat, as an average with fourteen cows.

The *figures cannot be regarded as other than highly satisfactory.*

A pleasing feature of the result is seen in comparing the average of these herds without the herd allowance, when Mr. Woodmason's herd shows an average almost identical with that of Mr. Lyon's.

Seeing the difference in the number of cows, the inference is that the tail end of the herd is a good one.



Mollie II. Silvermine III. Silvermine IV.

Owner, Mr. C. Gordon Lyon.

PRIZE LIST.

The following are the prizes offered by the Government for the year ended 30th June, 1916. The prizes will be awarded through the Royal Agricultural Society:—

(1) *Grand Champion Cow*—under Herd Test regulations.

A grand champion prize of *£100* as a trophy or cash for maintaining the position of annual champion for three successive years. *Not yet allotted.*

(2) *Annual Champion Cow*—under Herd Test regulations.

A prize of £25, to be awarded to the cow which, on completion of lactation period, gives the greatest amount of butter fat under the herd testing regulations of this Department during a lactation period terminating within a year ending 30th June. If two lactation periods are completed within the year, the last will be the period considered.

Won by "Jessie VI. of Melrose"; owner, Mr. W. Woodmason.

(3) *Annual Reserve Champion*—under Herd Test regulations.

A prize of £15 per annum to be awarded to the cow attaining second place under the herd testing regulations of the Department during year ended 30th June.

These prizes to be awarded conditionally upon the winning cow being exhibited at the next Royal Agricultural Show. In the event of the death of the winning cow prior to such show, the owner to exhibit his next best cow.

Won by "Lady Grey V."; owner, Mr. A. W. Jones.

(4) *Best Herd*—under Herd Testing regulations.

A prize of £50, to be awarded to the herd giving the greatest average return under the herd testing regulations of this Department under the following conditions:—

(1) Minimum number of cows (completing the test during the year) in a herd—10.

(2) Such herd to average 300 lbs. of butter fat.

(*a*) Handicaps to be allowed under the following scale:—

I. A herd of more than 10 cows will receive a handicap of ½ lb. of butter fat for each cow.

II. Cows entered under Regulation 11 (*a*) will receive a handicap of 75 lbs. of butter fat.

III. Cows entered under Regulation 11 (*b*) and (*c*) to receive a handicap of 50 lbs. of butter fat.

The prize to be allotted for the year ending 30th June, and the three best cows in the winning herd to be exhibited at the next Royal Agricultural Society's Show.

Won by Melrose Herd; owner, Mr. W. Woodmason.

No cow competing for any prize shall be milked more than twice a day, and must calve again within 15 months.

RETURN OF CERTIFICATED COWS FOR YEAR ENDING 30th JUNE, 1916.

MRS. A. BLACK, Noorat. (JERSEY).

Completed during the year—12. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Madge	3575	27.5.15	3.6.15	273	12	4,624½	5·04	233.04	200	265¾
Dolly of Clydebank II.	3742	9.8.15	16.8.15	248	4	3,596	6·32	227·46	200	259¼

A. BOX, Hiawatha. (JERSEY).

Completed during the year—8. Certificated—8.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Roseneath Sylvia ..	3776	9.11.14	16.11.14	273	8½	4,305	5·39	232·29	200	264¾
Roseneath Twylish ..	Not yet allotted	17.12.14	24.12.14	273	12½	3,884	5·21	202·58	175	231
Roseneath Fox's Twylish	3775	10.12.14	26.12.14	273	13	4,959	5·35	265·43	250	302½
Lass' Favourite ..	Not yet allotted	3.5.15	10.5.15	273	14	4,881½	4·42	215·82	175	246
Larkspur's, Claribelle VI.	3772	16.9.15	23.9.15	273	19	7,533½	4·72	355·52	250	405¼
Roseneath Daphne ..	3774	16.9.15	23.9.15	273	9½	4,968	5·48	272·38	250	310½
May's Gem	Not yet allotted	19.9.15	26.9.15	273	12	4,176½	4·91	205·29	175	234
Roseneath Favourite IV.	Not yet allotted	23.9.15	30.9.15	273	10½	5,821	4·45	250·33	200	295½

F. CURNICK, Malvern. (JERSEY).

Completed during the year—2. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Eva	3770	19.10.14	26.10.14	273	15¼	6,210½	4·78	297·28	200	338¾
Peerless Pearl ..	3771	2.2.15	9.2.15	273	17¾	6,017	5·27	317·23	200	361½

DEPARTMENT OF AGRICULTURE, Werribee. (RED POLL.)

Completed during the year—46. Certificated—40.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Britannia	Not yet allotted	6.10.14	13.10.14	273	16	6,889½	3·92	268·81	200	306½
Soudana	,,	20.11.14	27.11.14	273	15½	4,707	4·40	207·17	175	236¼
Laurel	,,	8.12.14	15.12.14	273	13½	5,006½	4·02	201·41	175	229¾
Ontario	,,	18.12.14	25.12.14	273	16	4,739	4·21	199·68	175	227¾
Japana	,,	24.12.14	31.12.14	273	19¼	6,568	3·50	229·74	200	262
Carribea	,,	3.1.15	10.1.15	273	18	5,518	4·29	236·92	200	270
Ardath	,,	15.1.15	22.1.15	273	13	6,189½	4·78	296·05	250	337¼
India	,,	8.3.15	15.3.15	273	26½	8,146	4·11	335·23	250	382¾
Connecticut	,,	3.4.15	10.4.15	273	21	7,204½	4·75	342·36	250	390¾
Panama	,,	12.4.15	19.4.15	273	17	5,869	4·23	248·45	200	283¾
Vuelta	,,	25.4.15	2.5.15	273	20	8,311½	4·03	334·89	250	381¾
Phillipina	,,	26.4.15	3.5.15	273	19	7,122½	4·82	343·13	250	391¼
Primrose League (imp.)	,,	10.5.15	17.5.15	273	19¼	6,831	4·34	296·27	250	327¾
Alpina	,,	13.5.15	20.5.15	273	15½	6,357	4·00	254·23	250	289¾
Turka	,,	16.5.15	23.5.15	273	32½	6,362½	4·96	315·02	250	360¼
Cameo	,,	23.5.15	30.5.15	273	15¼	5,873½	4·72	277·32	250	316¼
Sumatra	,,	24.5.15	31.5.15	273	20	7,494½	4·40	329·71	250	375¾
Tennessee ..	,,	26.5.15	2.6.15	273	14½	5,075½	4·09	207·77	200	236¾
Mexicana	,,	1.6.15	8.6.15	273	16	7,969	4·39	349·54	250	398¼
Asiana	,,	5.6.15	12.6.15	273	12¼	6,367	4·63	295·00	250	336¼
Samorna	,,	12.6.15	19.6.15	273	10¾	5,400½	4·71	254·68	200	290¾
Netherlana	,,	22.6.15	29.6.15	273	28	9,455½	4·25	402·03	250	458¼
Serbia	,,	30.5.15	6.7.15	*247	23½	4,271	4·22	179·79	175	205
Sylvia	,,	4.7.15	11.7.15	273	13½	4,899	4·78	234·43	200	267¼
Pipio	,,	2.8.15	9.8.15	273	13	5,906½	5·04	297·49	200	339¼
Itala	,,	3.10.15	10.8.15	273	16¼	4,695	4·14	194·30	175	221¼
La Reina	,,	12.8.15	19.8.15	273	17	6,004½	4·96	297·65	200	339¾
Cuba	,,	17.8.15	24.8.15	273	19¼	7,924	4·55	360·82	250	411¼
Kentucky	,,	22.8.15	29.8.15	273	18	9,032½	3·88	350·67	250	399¾
Russia	,,	25.7.16	1.8.15	273	23	4,933	3·82	188·69	175	215
Persica	,,	26.8.15	2.9.15	273	18¼	6,797½	4·93	335·29	250	382¼
Pennsylvania ..	,,	27.8.15	3.9.15	273	7	8,203	4·00	327·96	250	373¾
Picotee	,,	30.8.15	6.9.15	273	13¼	7,317	4·34	317·76	250	362¼
Lily	,,	1.9.15	8.9.15	273	18¾	7,077½	4·55	322·35	200	367½
Birdseye	,,	7.9.15	14.9.15	273	18	7,573	6·42	485·95	250	554
Bullion	,,	12.9.15	19.9.15	273	11½	7,121	4·38	311·79	250	355¼
Violet III.	,,	13.9.15	20.9.15	273	14½	7,940½	4·49	356·85	200	406¾
Pacifica	,,	17.9.15	24.9.15	273	18	3,868½	4·76	184·02	175	209¾
Mongolia	,,	17.9.15	24.9.15	273	10	7,415	4·30	319·81	200	364¼
Goldleaf	,,	20.9.15	27.9.15	245	4	6,665	4·43	295·62	250	337

* Lost first 26 days through weights not being available.

GEELONG HARBOUR TRUST, Marshalltown. (AYRSHIRE.)

Completed during the year—16. Certificated—6.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Gipsy Maid II. of Sparrovale ..	2511	25.11.14	2.12.14	273	13½	4,916	4·40	216·12	175	246½
Winnie of Glen Elgin	1850	25.2.15	4.3.15	273	12½	6,265½	4·18	262·20	250	299
Gipsy Maid of Glen Elgin	1818	2.4.15	9.4.15	273	8½	6,180	4·27	264·09	250	301
Ruby of Glen Elgin ..	1836	6.5.15	13.5.15	273	19	8,538	4.13	352.98	250	402½
Ruby of Sparrovale ..	2512	18.6.15	25.6.15	273	7½	7,178	4·37	313·42	200	357¾
Princess Edith of Gowrie Park	2376	1.9.15	8.9.15	273	7½	5,488½	4·19	229·85	200	262

TREVOR HARVEY, Boisdale. (JERSEY.)

Completed during the year—4. Certificated—4.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Dainty VI.	Not yet allotted	10.1.15	17.1.15	273	19½	5,306	5·66	300·33	175	342¼
Lady Marge IV. ..	..	12.4.15	19.4.15	273	12½	4,718½	5·43	256·21	175	292
Sparkle	2978	29.4.15	6.5.15	273	15	5,091	6·37	324·45	200	369¾
Bluebell of Pine Hills	2975	13.8.15	20.8.15	273	14	5,079	5·82	295·86	200	337¼

A. W. JONES, Whittington. (JERSEY.)

Completed during the year—4. Certificated—4.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Dolly	3754	10.12.14	17.12.14	273	18	4,936½	6·24	308·23	200	351½
Lady Grey I. of St. Albans	Not yet allotted	9.3.15	16.3.15	273	17½	5,255	6·61	347·36	175	396
Lady Grey VIII. ..	,,	28.3.15	4.4.15	273	17½	7,126½	5·35	381·76	200	435¼
Lady Grey V.* ..	3756	8.7.15	15.7.15	273	33	9,615	5·11	491·59	250	560¼

* Owing to an error in the calving and expiry dates this cow was not credited with full yield in the quarterly report.

C. G. KNIGHT, Cobram. (JERSEY.)

Completed during the year—18. Certificated—16.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Arcadia	1534	28.9.14	4.10.14	273	9	4,842½	5·49	265·90	250	303
Bridesmaid of Tarnpirr	2981	2.10.14	9.10.14	273	11	4,676	4·85	226·60	175	258¼
Princess of Tarnpirr ..	2986	8.10.14	15.10.14	273	8	4,835	5·09	246·26	200	280¾
Mistletoe of Tarnpirr ..	2984	23.1.15	30.1.15	273	17	5,282	5·29	279·32	200	318¼
Romany Lass ..	2563	18.5.15	25.5.15	273	11½	5,032½	5·63	283·50	200	323¼
Amy Castles ..	1520	31.5.15	7.6.15	273	11	5,542	5·29	293·16	250	334¼
Alice of Tarnpirr ..	Not yet allotted	14.7.15	21.7.15	273	7	3,870	5·80	224·60	175	256
Sweetheart of Tarnpirr	2987	18.7.15	25.7.15	273	10½	5,056	4·55	231·08	200	263½
Lily of Tarnpirr ..	2221	24.7.15	31.7.15	273	11	6,293	4·53	285·03	250	325
Idyll's Ideal ..	2096	30.7.15	6.8.15	273	11½	5,426½	4·96	269.49	250	307½
Mythic	2404	6.8.15	13.8.15	273	14½	7,096½	5·09	361·27	250	411¾
Foxglove of Tarnpirr ..	2983	13.8.15	20.8.15	273	10½	4,512½	5·89	265·96	200	303¼
Arcadia	1534	17.8.15	24.8.15	273	16½	6,955¼	5·31	369·55	250	421¼
Primrose of Tarnpirr ..	2985	27.8.15	3.9.15	273	10½	4,655	5·81	270·90	200	308¾
Bridesmaid of Tarnpirr	2981	7.9.15	14.9.15	273	10½	4,634½	4·58	212·24	200	242
Bonnie of Tarnpirr ..	2980	15.9.15	22.9.15	273	14½	5,208½	5·19	270·13	200	308

C. D. LLOYD, Caulfield. (JERSEY.)

Completed during the year—6. Certificated—6.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Brownbread ..	Not yet allotted	27.10.14	3.11.14	273	8	3,936½	6·32	248·70	175	283½
Countess Twylish ..	928	28.10.14	4.11.14	273	21	8,150	5·24	427·50	250	487¼
Queen Spark ..	2533	5.12.14	12.12.14	273	11½	4,282½	6·71	287·19	250	327½
Doreen	2076	6.5.15	13.5.15	273	8½	5,238	5·13	268·93	200	306½
Creambread	Not yet allotted	19.8.15	26.8.15	273	15	5,203	5·97	310·81	175	354¼
Sweetbread XIV. ..	2979	24.8.15	31.8.15	273	16	8,484	5·33	452·42	250	515¾

C. GORDON LYON, Heidelberg. (JERSEY.)

Completed during the year—14. Certificated—14.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lassie III. of Banyule	3620	18.10.14	25.10.14	273	9½	*3,980	5·01	199·36	175	227¼
Lassie	509	23.10.14	30.10.14	273	16	6,997¼	5·24	366·50	250	417¾
Molly III. of Banyule ..	3624	6.11.14	13.11.14	273	8	3,790	5·59	211·85	200	241½
Lassie II.	1136	10.12.14	17.12.14	273	25½	8,544	4·91	419·56	250	478¼
Ettie IV.	2889	16.12.14	23.12.14	273	25	8,743	4·56	398·86	250	454¾
Silver Audrey ..	1378	19.1.15	26.1.15	273	6½	5,887	4·85	285·74	250	325¾
Silvermine III. ..	715	19.2.15	26.2.15	273	27	8,037½	4·98	400·16	250	456¼
Hawthorn of Banyule	*1064*	*16.3.15*	*23.3.15*	*273*	*21½*	*7,557½*	*5·09*	*385·12*	*250*	*439*
Hawthorn II. of Banyule	3619	1.4.15	8.4.15	273	8	5,451	5·63	307·01	200	350
Velveteen II. ..	2927	2.4.15	†5.5.15	273	23	8,361	4·59	383·95	250	437¾
Noreen	636	1.8.15	8.8.15	273	23	10,314½	4.59	473·42	250	539¾
Parrakeet	3625	31.8.15	7.9.15	273	20	9,827	4·47	438·90	200	500¼
Molly IV.	*Not yet allotted.*	6.9.15	13.9.15	273	9½	5,622	5·38	302·28	175	344½
Molly II.	614	24.9.15	1.10.15	273	16	8,708	4·84	421·80	250	480¾

* An ailment of the udder temporarily affected yield.
† Entry deferred because earlier weights not available.

J. D. READ, Springhurst. (JERSEY.)

Completed during the year—25. Certificated—20.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Princess of Springhurst	2621	4.4.15	11.4.15	273	8½	5,809	6·05	355·28	250	405
Princess Defiance of Springhurst ..	Not yet allotted	8.4.15	15.4.15	273	8	4,528½	5·45	246·89	175	281½
Tulip of Springhurst ..	2730	10.4.15	17.4.15	273	11	5,735	5·59	320·89	250	365¾
Stockings of Springhurst	2663	23.4.15	30.4.15	250	0	5,464	5·05	275·84	250	314½

J. D. READ, Springhurst. (JERSEY)—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Euroa of Springhurst ..	1918	26.4.15	3.5.15	273	5	4,960½	5·54	275·57	250	314¼
Graceful Magnet of Springhurst ..	2058	3.5.15	10.5.15	273	13	6,392	5.37	343.25	250	391¼
Musk of Springhurst ..	Not yet allotted	8.5.15	15.5.15	273	11	3,700½	5·56	205·95	175	284¾
Balsam of Springhurst	..	21.5.15	28.5.15	273	14	4,221	5·21	220·02	175	250¾
Alsyke of Springhurst	1515	10.6.15	17.6.15	273	8	5,724	5·26	301·07	250	343¼
Daisy of Springhurst ..	1788	14.6.15	21.6.15	273	9½	5,673	5·23	296·56	250	338
Grannie of Springhurst	2059	14.6.15	21.6.15	273	5	5,385½	5·23	281·65	250	321
Hyacinth of Springhurst	3705	22.6.15	29.6.15	273	9	3,713	5·89	218·74	200	249½
Arum of Springhurst ..	Not yet allotted	25.6.15	2.7.15	273	10	4,529½	5·34	240·26	175	274
Buttercup of Springhurst	3702	27.6.15	4.7.15	273	8	5,369	6·03	323·80	250	369¼
Boronia of Springhurst	Not yet allotted	5.7.15	12.7.15	273	4	4,081	5·00	201·67	175	230
Shamrock of Springhurst	3708	13.7.15	20.7.15	258	4	4,065½	5·14	209·12	200	238½
Foxglove of Springhurst	3704	15.7.15	22.7.15	273	4	5,575	4·87	271·48	250	309½
Honeysuckle of Springhurst	Not yet allotted	18.7.15	25.7.15	273	9½	4,053½	5·22	211·82	175	241½
Dulcie of Springhurst	1878	31.7.15	7.8.15	273	6½	5,691	5·79	329·66	250	375¾
Nightshade of Springhurst	*3707*	12.8.15	19.8.15	273	22½	8,051	5·10	410·32	250	467¾

Miss S. L. ROBINSON, Malvern. (JERSEY.)

Completed during the year—6. Certificated—3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lotina (imp.) ..	1160	30.9.14	7.10.14	227	5	6,052¼	5·16	312·19	250	356
Larkspur's Claribelle ..	1132	14.10.14	21.10.14	273	17½	6,631	4·79	317·46	250	362
Lotina (imp.) ..	1160	8.8.15	15.8.15	273	19	7,784	5·19	403·95	250	460½

D. SADLER, Camperdown. (AYRSHIRE.)

Completed during the year—8. Certificated—1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Flirt of Kilmarnock ..	3091	4.11.14	11.11.14	273	25	7,051	3·79	267·05	250	304½

C. E. WOOD, Frankston. (JERSEY.)

Completed during the year—2. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Jersey May	2115	23.11.14	30.11.14	273	8½	7,130½	4·96	353·96	250	403¾
White Bell II. ..	3728	25.10.14	*1.12.14	273	9	3,333	5·94	198·01	175	225¾

* Entry deferred until weights available.

E. N. WOOD, Caulfield. (JERSEY.)

Completed during the year—2. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Luxury	3725	7.10.14	14.10.14	273	17	8,119¾	5·40	438·83	250	500¼
Luxury	3725	24.9.15	1.10.15	273	23½	9,012	5·01	461·04	250	525¾

W. WOODMASON, Malvern. (JERSEY.)

Completed during the year—52. Certificated—51.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Daisy VI. of Melrose ..	Not yet allotted	25.9.14	2.10.14	273	10½	4,699½	5·14	241·83	175	276¾
Banker VI. of Melrose	3631	26.9.14	3.10.14	273	15	5,402¼	5·64	304·76	200	347¼
Jessie V. of Melrose ..	3652	5.10.14	12.10.14	273	19¼	7,910½	5·26	416·81	250	475¾
Edith II. of Melrose ..	Not yet allotted	10.10.14	17.10.14	273	14	5,418	5·48	296·60	175	338¾
Flower VI. of Melrose	3641	11.10.14	18.10.14	273	13	5,274½	6·14	324·17	250	369¼

W. WOODMASON, Malvern—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
Graceful Duchess XI. of Melrose	Not yet allotted	14.10.14	21.10.14	273	14½	4,470½	6·02	269·29	175	307
Quality VI. of Melrose	3674	20.10.14	27.10.14	273	18	8,349½	5·73	478·44	250	545½
Mystery XII. of Melrose	3667	21.10.14	28.10.14	273	17¼	6,565½	5·28	346·48	250	395
Fuchsia X. of Melrose	Not yet allotted	12.11.14	19.11.14	273	10½	5,503	4·51	248·39	175	283¼
Daisy V. of Melrose ..	3637	20.11.14	27.11.14	273	18¼	6,441	5·27	339·51	200	387
Jessie XII. of Melrose	Not yet allotted	20.11.14	27.11.14	273	18	5,063½	5·99	303·21	175	345¾
Rarity VI. of Melrose	3675	27.11.14	4.12.14	273	18¼	8,023	5·28	423·48	250	482¾
Mystery XIII. of Melrose ..	3668	2.12.14	9.12.14	273	16	6,044	6·46	390·72	200	445½
Chevy VIII. of Melrose	Not yet allotted	17.12.14	24.12.14	273	19	6,011	5·63	338·56	175	386
Mystery IX. of Melrose	3665	21.1.15	28.1.15	273	23½	7,047½	5·98	421·60	250	480½
Mermaid II. of Melrose	Not yet allotted	1.2.15	8.2.15	273	18	6,733	5·13	345·36	250	393¾
Purity IV. of Melrose	1324	6.2.15	13.2.15	273	20	5,634½	5·72	322·48	250	367½
Jessie IX. of Melrose ..	3654	11.2.15	18.2.15	273	22	7,359	5·69	418·62	250	477¼
Lassie Fowler III. of Melrose	1137	22.2.15	1.3.15	273	23	8,121	5·49	446·29	250	508¾
Zoe V. of Melrose ..	1496	22.2.15	1.3.15	273	16½	6,159½	6·58	405·26	250	462
Jenny Lind VIII. of Melrose	3651	18.3.15	25.3.15	273	19	6,332	5·47	346·38	200	394¾
Rarity V. of Melrose ..	1344	20.3.15	27.3.15	273	20	8,183½	5·24	429·06	250	489
Mystery VIII. of Melrose	3664	25.3.15	1.4.15	273	15½	6,027	6·13	369·68	250	421½
Laura VI. of Melrose ..	3658	5.4.15	12.4.15	273	14	7,172	5·80	416·36	250	474¾
Jessie's Progress ..	3657	16.4.15	23.4.15	273	18½	7,784½	5·96	464·28	250	529¼
Pearl III. of Melrose ..	Not yet allotted	20.4.15	27.4.15	273	9	4,016¼	6·49	260·62	175	297
Lady Melrose IV. ..	,,	27.4.15	4.5.15	273	18½	7,336	4·92	360·99	200	411½
Jessie XIII. of Melrose	,,	5.6.15	12.6.15	273	13¼	5,261¼	6·21	327·17	175	373
Vanilla VI. of Melrose	,,	12.7.15	19.7.15	273	13½	7,053	4·44	313·85	250	357¾
Graceful Duchess X. of Melrose	3646	18.7.15	25.7.15	273	11	5,565	6·04	336·63	200	383¾
Merry Girl IV. of Melrose	3662	30.7.15	6.8.15	273	11	6,023½	5·38	325·10	250	370½
Graceful Duchess VIII. of Melrose ..	1056	10.8.15	17.8.15	273	26¼	9,026	5·28	476·95	250	543¾
Jessie VI. of Melrose ..	Not yet allotted	10.8.15	17.8.15	273	13½	8,342	6·27	523·34	250	596½
Polly II. of Melrose ..	,,	12.8.15	19.8.15	273	15½	7,161	4·96	355·57	200	405¼
Pearl of Melrose ..	3669	13.8.15	20.8.15	273	18	7,511½	4·57	343·94	250	392
Waverley Lass II. of Melrose	Not yet allotted	16.8.15	23.8.15	273	9	3,845½	6·06	233·37	175	266
Jessie XI. of Melrose ..	3656	18.8.15	25.8.15	273	16½	7,317½	5·89	430·21	250	490½
Vanilla V. of Melrose ..	3678	18.8.15	25.8.15	273	14	8,644¼	4·54	392·96	250	448
Jessie VIII. of Melrose	3653	22.8.15	29.8.15	273	18	7,268½	5·28	384·50	250	438¼
Fuchsia XI. of Melrose	Not yet allotted	23.8.15	30.8.15	273	9½	4,134	5·64	233·54	175	266¼
Peerless VII. of Melrose	3672	23.8.15	30.8.15	273	11	5,981½	5·15	306·94	250	350
Empire V. of Melrose	Not yet allotted	24.8.15	31.8.15	273	14½	6,696½	5·22	353·64	200	403¼
Lizzie VI. of Melrose ..	,,	26.8.15	2.9.15	273	7	5,082	4·60	234·22	200	267
Sweet Pansy II. of Melrose	,,	28.8.15	4.9.15	273	8	3,850½	5·73	220·62	175	251½
Handsome Girl VII. of Melrose	,,	29.8.15	5.9.15	273	12½	4,829	6·63	320·63	175	365½
Sweet Pansy of Melrose	1413	31.8.15	7.9.15	273	7	5,304¼	5·67	300·23	250	349
Lady Elector II. of Melrose	Not yet allotted	3.9.15	10.9.15	273	11	4,421½	5·94	262·85	175	299¾
Jessie X. of Melrose ..	3655	4.9.15	11.9.15	273	14½	6,716	5·24	352·02	250	401¼
Carrie V. of Melrose ..	3634	7.9.15	14.9.15	273	15	6,580½	5·26	346·26	250	394¾
Peerless VIII. of Melrose	3673	2.9.15	*16.9.15	273	15	7,108	5·48	390·26	250	445
Gaiety Girl VIII. of Melrose	Not yet allotted	15.9.15	22.9.15	273	11	4,759	5·39	256·53	175	292½

* Entry extended seven days as weights not available.

C. E. WOOD, Frankston. (JERSEY.)

Completed during the year—2. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Jersey May	2115	23.11.14	30.11.14	273	8¼	7,136¼	4·96	353·96	250	403¼
White Bell II. ..	3723	25.10.14	*1.12.14	273	9	3,333	5·94	198·01	175	225¾

* Entry deferred until weights available.

E. N. WOOD, Caulfield. (JERSEY.)

Completed during the year—2. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Luxury	3725	7.10.14	14.10.14	278	17	8,119¾	5·40	438·83	250	500¼
Luxury	3725	24.9.15	1.10.15	273	23½	9,012	5·01	461·04	250	525½

W. WOODMASON, Malvern. (JERSEY.)

Completed during the year—52. Certificated—51.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Daisy VI. of Melrose ..	Not yet allotted	25.9.14	2.10.14	273	10½	4,699½	5·14	241·83	175	275¾
Banker VI. of Melrose	3631	26.9.14	3.10.14	273	15	5,402¼	5·64	304·76	200	347¼
Jessie V. of Melrose ..	3652	5.10.14	12.10.14	273	19½	7,919½	5·26	416·81	250	475¼
Edith II. of Melrose ..	Not yet allotted	10.10.14	17.10.14	273	14	5,418	5·48	296·69	175	338¼
Flower VI. of Melrose	3641	11.10.14	18.10.14	273	13	5,274½	6·14	324·17	250	369½

W. WOODMASON, Malvern—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
Graceful Duchess XI. of Melrose	Not yet allotted	14.10.14	21.10.14	273	14½	4,470½	6·02	269·29	175	307
Quality VI. of Melrose	3674	20.10.14	27.10.14	273	18	8,340½	5·73	478·44	250	545½
Mystery XII. of Melrose	3667	21.10.14	28.10.14	273	17½	6,565½	5·28	346·48	250	395
Fuchsia X. of Melrose	Not yet allotted	12.11.14	19.11.14	273	16½	5,503	4·51	248·39	175	283¼
Daisy V. of Melrose ..	3637	20.11.14	27.11.14	273	18½	6,441	5·27	339·51	200	387
Jessie XII. of Melrose	Not yet allotted	20.11.14	27.11.14	273	15	5,062¾	5·99	303·21	175	345¾
Rarity VI. of Melrose	3675	27.11.14	4.12.14	273	18½	8,023	5·28	423·48	250	482¾
Mystery XIII. of Melrose ..	3668	2.12.14	9.12.14	273	16	6,044	6·46	390·72	200	445½
Chevy VIII. of Melrose	Not yet allotted	17.12.14	24.12.14	273	19	6,011	5·63	338·56	175	386
Mystery IX. of Melrose	3665	21.1.15	28.1.15	273	23½	7,047½	5·98	421·60	250	480½
Mermaid II. of Melrose	Not yet allotted	1.2.15	8.2.15	273	18	6,733	5·13	345·36	250	393¾
Purity IV. of Melrose	1324	6.2.15	13.2.15	273	20	5,634½	5·72	322·48	250	367½
Jessie IX. of Melrose ..	3654	11.2.15	18.2.15	273	22	7,350	5·69	418·62	250	477½
Lassie Fowler III. of Melrose	1137	22.2.15	1.3.15	273	23	8,121	5·40	440·20	250	508¾
Zoe V. of Melrose ..	1496	22.2.15	1.3.15	273	16½	6,159½	6·58	405·26	250	462
Jenny Lind VIII. of Melrose	3651	18.3.15	25.3.15	273	13	6,332	5·47	346·38	200	394¾
Rarity V. of Melrose ..	1344	20.3.15	27.3.15	273	20	8,183½	5·24	429·08	250	489
Mystery VIII. of Melrose	3664	25.3.15	1.4.15	273	15½	6.027	6·13	369·68	250	421½
Laura VI. of Melrose ..	3658	5.4.15	12.4.15	273	14	7,172	5·80	416·36	250	474¾
Jessie's Progress ..	3657	16.4.15	23.4.15	273	18½	7,784½	5·96	464·28	250	529½
Pearl III. of Melrose ..	Not yet allotted	20.4.15	27.4.15	273	9	4,010½	6·49	260·62	175	297
Lady Melrose IV. ..	,,	27.4.15	4.5.15	273	18½	7,336	4·92	360·99	200	411½
Jessie XIII. of Melrose	,,	5.6.15	12.6.15	273	13½	5,261½	6·21	327·17	175	373
Vanilla VI. of Melrose	,,	12.7.15	19.7.15	273	13½	7,053	4·44	313·85	250	357¾
Graceful Duchess X. of Melrose	3646	18.7.15	25.7.15	273	11	5,565	6·04	336·63	200	383¾
Merry Girl IV. of Melrose	3662	30.7.15	6.8.15	273	11	6,023½	5·38	325·10	250	370¾
Graceful Duchess VIII. of Melrose ..	1056	10.8.15	17.8.15	273	20½	9,026	5·28	476·95	250	543¾
Jessie VI. of Melrose ..	Not yet allotted	10.8.15	17.8.15	273	13½	8,342	6·27	523·34	250	596½
Polly II. of Melrose ..	,,	12.8.15	19.8.15	273	16½	7,161	4·96	355·57	200	405½
Pearl of Melrose ..	3669	13.8.15	20.8.15	273	18	7,511½	4·57	343·94	250	392
Waverley Lass II. of Melrose	Not yet allotted	16.8.15	23.8.15	273	9	3,845½	6·06	223·37	175	266
Jessie XI. of Melrose ..	3656	18.8.15	25.8.15	273	16½	7,317½	5·89	430·21	250	490½
Vanilla V. of Melrose ..	3678	18.8.15	25.8.15	273	14	8,644½	4·54	392·96	250	448
Jessie VIII. of Melrose	3653	22.8.15	29.8.15	273	18	7,268¾	5·28	384·50	250	438½
Fuchsia XI. of Melrose	Not yet allotted	23.8.15	30.8.15	273	9½	4,134	5·64	233·54	175	266¼
Peerless VII. of Melrose	3672	23.8.15	30.8.15	273	11	5,931½	5·15	306·94	250	350
Empire V. of Melrose	Not yet allotted	24.8.15	31.8.15	273	14½	6,696½	5·22	358·04	200	403½
Lizzie VI. of Melrose ..	,,	26.8.15	2.9.15	273	7	5,082	4·60	234·22	200	267
Sweet Pansy II. of Melrose	,,	28.8.15	4.9.15	273	8	3,850½	5·73	220·62	175	251½
Handsome Girl VII. of Melrose	,,	29.8.15	5.9.15	273	12½	4,829	6·63	320·63	175	365½
Sweet Pansy of Melrose	1413	31.8.15	7.9.15	273	7	5,394½	5·67	306·23	250	349
Lady Elector II. of Melrose	Not yet allotted	3.9.15	10.9.15	273	11	4,421½	5·94	262·85	175	299¾
Jessie X. of Melrose ..	3655	4.9.15	11.9.15	273	14½	6,716	5·24	352·02	250	401½
Carrie V. of Melrose ..	3634	7.9.15	14.9.15	273	15	6,580½	5·26	346·26	250	394¾
Peerless VIII. of Melrose	3673	2.9.15	*16.9.15	273	15	7,108	5·48	390·28	250	445
Gaiety Girl VIII. of Melrose	Not yet allotted	15.9.15	22.9.15	273	11	4,759	5·39	256·53	175	292½

* Entry extended seven days as weights not available.

COWS IN ORDER OF MERIT.

Cows over 4 years of Age or on third lactation period—250 lbs. Standard.

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
1	Jessie VI. of Melrose	..	W. Woodmason ..	Jersey ..	8,342	6·27	523·34	596¼
2	Lady Grey V.	3756	A. W. Jones ..	" ..	9,615	5·11	491·59	560¼
3	Birdseye	..	Department of Agriculture	Red Poll	7,573	6·42	485·95	554
4	Quality VI. of Melrose ..	3674	W. Woodmason ..	Jersey ..	8,349½	5·73	478·44	545¼
5	Graceful Duchess VIII. of Melrose	1056	W. Woodmason ..	" ..	9,026	5·28	476·95	543¾
6	Noreen	636	C. G. Lyon ..	" ..	10,314¼	4·59	473·42	539¾
7	Jessie's Progress	3657	W. Woodmason ..	" ..	7,784¼	5·96	464·28	520¼
8	Luxury	3725	E. N. Wood ..	" ..	9,012	5·01	461·04	525¼
9	Sweetbread	2979	C. D. Lloyd ..	" ..	8,484	5·33	452·42	515¾
10	Lassie Fowler III. of Melrose	1137	W. Woodmason ..	" ..	8,121	5·49	446·29	508¾
11	Luxury	3725	E. N. Wood ..	" ..	8,119¾	5·40	438·83	500¼
12	Jessie XI. of Melrose ..	3656	W. Woodmason ..	" ..	7,317¼	5·89	430·21	490¼
13	Rarity V. of Melrose ..	1344	W. Woodmason ..	" ..	8,183½	5·24	429·06	489
14	Countess Twylish ..	928	C. D. Lloyd ..	" ..	8,150	5·24	427·50	487¾
15	Rarity VI. of Melrose ..	3675	W. Woodmason ..	" ..	8,023	5·28	423·48	482¾
16	Molly II.	614	C. G. Lyon ..	" ..	8,708	4·84	421·80	480¾
17	Mystery IX. of Melrose ..	3665	W. Woodmason ..	" ..	7,047¼	5·98	421·60	480¼
18	Lassie II.	1136	C. G. Lyon ..	" ..	8,544	4·91	419·56	478¼
19	Jessie IX. of Melrose ..	3654	W. Woodmason ..	" ..	7,350	5·69	418·62	477¼
20	Jessie V. of Melrose ..	3652	W. Woodmason ..	" ..	7,919¼	5·26	416·81	475¼
21	Laura VI. of Melrose ..	3658	W. Woodmason ..	" ..	7,172	5·80	416·36	474¾
22	Nightshade of Springhurst	3707	J. D. Read ..	" ..	8,051	5·10	410·32	467¾
23	Zoe V. of Melrose ..	1496	W. Woodmason ..	" ..	6,159½	6·58	405·26	462
24	Lotina	1160	Miss S. L. Robinson	" ..	7,784	5·19	403·95	460¼
25	Netherlana	..	Department of Agriculture	Red Poll	9,455¼	4·25	402·03	458¼
26	Silvermine III.	715	C. G. Lyon ..	Jersey ..	8,037½	4·98	400·16	456¼
27	Ettie IV.	2839	C. G. Lyon ..	" ..	8,743	4·56	398·86	454¾
28	Vanilla V. of Melrose ..	3678	W. Woodmason ..	" ..	8,644½	4·54	392·96	448
29	Peerless VIII. of Melrose ..	3673	W. Woodmason ..	" ..	7,108	5·48	390·26	445
30	Hawthorn of Banyule ..	1064	C. G. Lyon ..	" ..	7,557½	5·09	385·12	439
31	Jessie VIII. of Melrose ..	3653	W. Woodmason ..	" ..	7,268½	5·28	384·50	438¼
32	Velveteen II.	2027	C. G. Lyon ..	" ..	8,361	4·59	383·95	437¾
33	Mystery VIII. of Melrose ..	3664	W. Woodmason ..	" ..	6,027	6·13	369·68	421¼
34	Arcadia	1534	C. G. Knight ..	" ..	6,955¼	5·31	369·55	421½
35	Lassie	509	C. G. Lyon ..	" ..	6,997½	5·24	366·50	417¾
36	Mythic	2404	C. G. Knight ..	" ..	7,096¼	5·09	361·27	411¾
37	Cuba	..	Department of Agriculture	Red Poll	7,924	4·55	360·82	411½
38	Larkspur's Claribelle VI. ..	3772	A. Box	Jersey ..	7,533½	4·72	355·52	405½
39	Princess of Springhurst ..	2521	J. D. Read ..	" ..	5,869	6·05	355·28	405
40	Jersey May	2115	C. E. Wood ..	" ..	7,136¼	4·96	353·96	403½
41	Ruby of Glen Elgin ..	1836	Geelong Harbor Trust	Ayrshire ..	8,538	4·13	352·98	402¼
42	Jessie X. of Melrose ..	3655	W. Woodmason ..	Jersey ..	6,716	5·24	352·02	401¼
43	Kentucky	..	Department of Agriculture	Red Poll	9,032½	3·88	350·67	399¾
44	Mexicana	..	Department of Agriculture	" ..	7,960	4·39	349·54	398½
45	Mystery XII. of Melrose ..	3667	W. Woodmason ..	Jersey ..	6,565¼	5·28	346·48	395
46	Carrie V. of Melrose ..	3634	W. Woodmason ..	" ..	6,580¾	5·26	346·26	394¾
47	Mermaid II. of Melrose ..	..	W. Woodmason ..	" ..	6,733	5·13	345·38	393¾
48	Pearl of Melrose	3669	W. Woodmason ..	" ..	7,511¼	4·57	343·94	392
49	Graceful Magnet of Springhurst	2058	J. D. Read ..	" ..	6,392	5·37	343·25	391½
50	Phillipina	..	Department of Agriculture	Red Poll ..	7,122½	4·82	343·13	391½
51	Connecticut	..	Department of Agriculture	" ..	7,204½	4·75	342·36	390½
52	Persica	..	Department of Agriculture	" ..	6,797½	4·93	335·29	382½
53	India	..	Department of Agriculture	" ..	8,146	4·11	335·28	382½
54	Vuelta	..	Department of Agriculture	" ..	8,311½	4·03	334·89	381¾
55	Sumatra	..	Department of Agriculture	" ..	7,494½	4·40	329·71	375¾
56	Dulcie of Springhurst ..	1878	J. D. Read ..	Jersey ..	5,691	5·79	329·66	375¾
57	Pennsylvania	..	Department of Agriculture	Red Poll	8,203	4·00	327·96	373¾

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
58	Merry Girl IV. of Melrose ..	3662	W. Woodmason ..	Jersey ..	6,023½	5·38	325·10	370½
59	Flower VI. of Melrose ..	3641	W. Woodmason ..	,, ..	5,274½	6·14	324·17	369½
60	Buttercup of Springhurst ..	3702	J. D. Read ..	,, ..	5,369	6·03	323·80	369¼
61	Purity IV. of Melrose ..	1324	W. Woodmason ..	,, ..	5,634½	5·72	322·48	367¾
62	Tulip of Springhurst ..	2730	J. D. Read ..	,, ..	5,735	5·59	320·89	365¾
63	Picotee	..	Department of Agriculture	Red Poll	7,317	4·34	317·76	362¼
64	Larkspur's Claribelle ..	1132	Miss S. L. Robinson	Jersey ..	6,631	4·79	317·46	362
65	Turka	..	Department of Agriculture	Red Poll	6,362½	4·96	315·92	360¼
66	Vanilla VI. of Melrose ..	..	W. Woodmason ..	Jersey ..	7,053	4·44	313·85	357¾
67	Lotina	1160	Miss S. L. Robinson	,, ..	6,052½	5·16	312·19	356
68	Bullion	..	Department of Agriculture	Red Poll	7,121	4·38	311·79	355½
69	Peerless VII. of Melrose ..	3672	W. Woodmason ..	Jersey ..	5,931½	5·15	306·94	350
70	Sweet Pansy of Melrose ..	1413	W. Woodmason ..	,, ..	5,394½	5·67	306·23	349
71	Alsyke of Springhurst ..	1515	J. D. Read ..	,, ..	5,724	5·26	301·07	343¼
72	Daisy of Springhurst ..	1788	J. D. Read ..	,, ..	5,673	5·23	296·56	338
73	Primrose League ..	..	Department of Agriculture	Red Poll	6,831	4·34	296·27	337¾
74	Ardath	..	Department of Agriculture	,, ..	6,180½	4·78	296·05	337½
75	Goldleaf	..	Department of Agriculture	,, ..	6,665	4·43	295·62	337
76	Asiana	..	Department of Agriculture	,, ..	6,367	4·63	295·00	336¼
77	Amy Castles	1520	C. G. Knight ..	Jersey ..	5,542	5·29	293·16	334¼
78	Queen Spark	2533	C. D. Lloyd ..	,, ..	4,282½	6·71	287·19	327½
79	Silver Audrey	1378	C. G. Lyon ..	,, ..	5,887	4·85	285·74	325¾
80	Lily of Tarnpirr	2221	C. G. Knight ..	,, ..	6,293	4·53	285·03	325
81	Grannie of Springhurst ..	2059	J. D. Read ..	,, ..	5,385½	5·23	281·65	321
82	Cameo	..	Department of Agriculture	Red Poll	5,873½	4·72	277·32	316¼
83	Stockings of Springhurst ..	2663	J. D. Read ..	Jersey ..	5,464	5·05	275·84	314½
84	Euroa of Springhurst ..	1918	J. D. Read ..	,, ..	4,969½	5·54	275·57	314¼
85	Roseneath Daphne ..	3774	A. Box	,, ..	4,968	5·48	272·38	310½
86	Foxglove of Springhurst ..	3704	J. D. Read ..	,, ..	5,575	4·87	271·48	309½
87	Idyll's Ideal	2096	C. G. Knight ..	,, ..	5,426½	4·96	269·49	307¼
88	Flirt of Kilmarnock ..	3091	D. Sadler ..	Ayrshire ..	7,051	3·79	267·05	304½
89	Arcadia	1534	C. G. Knight ..	Jersey ..	4,842½	5·49	265·90	303
90	Roseneath Fox's Twylish ..	3775	A. Box	,, ..	4,959	5·35	265·43	302½
91	Gipsy Maid of Glen Elgin	1818	Geelong Harbor Trust	Ayrshire	6,180	4·27	264·09	301
92	Winnie of Glen Elgin ..	1850	Geelong Harbor Trust	,, ..	6,265½	4·18	262·20	299
93	Alpina	..	Department of Agriculture	Red Poll	6,357	4·00	254·23	289¾

Cows under 4 Years of Age—200 lbs. Standard.

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
1	Parrakeet	3625	C. G. Lyon ..	Jersey ..	9,827	4·47	438·90	500¼
2	Mystery XIII. of Melrose ..	3668	W. Woodmason ..	,, ..	6,044	6·46	390·72	445½
3	Lady Grey VIII. ..	..	A. W. Jones ..	,, ..	7,126½	5·35	381·76	435¼
4	Lady Melrose IV. ..	..	W. Woodmason ..	,, ..	7,336	4·92	360·99	411½
5	Violet III.	..	Department of Agriculture	Red Poll	7,940½	4·49	356·85	406¾
6	Polly II. of Melrose ..	..	W. Woodmason ..	Jersey ..	7,161	4·96	355·57	405½
7	Empire V. of Melrose ..	3651	W. Woodmason ..	,, ..	6,696½	5·22	353·64	403¼
8	Jenny Lind VIII. of Melrose	..	W. Woodmason ..	,, ..	6,332	5·47	346·38	394¾
9	Daisy V. of Melrose ..	3637	W. Woodmason ..	,, ..	6,441	5·27	339·51	387
10	Graceful Duchess X. of Melrose	3646	W. Woodmason ..	,, ..	5,565	6·04	336·63	383¾
11	Sparkle	2978	T. Harvey ..	,, ..	5,091	6·37	324·45	369¾
12	Lily	..	Department of Agriculture	Red Poll	7,077½	4·55	322·35	367½

Cows under 4 Years of Age—200 lbs. Standard—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
13	Mongolia	..	Department of Agriculture	Red Poll ..	7,415	4·30	319·81	364¼
14	Peerless Pearl	3771	F. Curnick ..	Jersey ..	6,017	5·27	317·23	361¾
15	Ruby of Sparrovale ..	2512	Geelong Harbor Trust	Ayrshire ..	7,178	4·37	313·42	357¾
16	Dolly	3754	A. W. Jones ..	Jersey ..	4,936¼	6·24	308·23	351¼
17	Hawthorn II. of Banyule ..	3619	C. G. Lyon ..	,, ..	5,451	5·63	307·01	350
18	Banker VI. of Melrose ..	3631	W. Woodmason ..	,, ..	5,402½	5·64	304·76	347¼
19	La Reina	..	Department of Agriculture	Red Poll	6,004¾	4·96	297·65	339½
20	Piplo	..	Department of Agriculture	,, ..	5,906¼	5·04	297·49	339¼
21	Eva	3770	F. Curnick ..	Jersey ..	6,216¼	4·78	297·26	338¾
22	Blue Bell of Pine Hills ..	2975	T. Harvey ..	,, ..	5,079	5·82	295·86	337¾
23	Romany Lass	2563	C. G. Knight ..	,, ..	5,032¼	5·63	283·50	323¾
24	Mistletoe of Tarnpirr ..	2984	C. G. Knight ..	,, ..	5,282	5·29	279·32	318¾
25	Primrose of Tarnpirr ..	2985	C. G. Knight ..	,, ..	4,655	5·81	270·90	308¾
26	Bonnie of Tarnpirr ..	2980	C. G. Knight ..	,, ..	5,208¼	5·19	270·13	308
27	Dorean	2976	C. D. Lloyd ..	,, ..	5,238	5·13	268·93	306¼
28	Britannia	..	Department of Agriculture	Red Poll	6,889¼	3·92	265·81	306¼
29	Foxglove of Tarnpirr ..	2983	C. G. Knight ..	Jersey ..	4,512¼	5·89	265·96	303¼
30	Roseneath Favourite IV. ..	..	A. Box	,, ..	5,821	4·45	259·33	295¾
31	Samorna	..	Department of Agriculture	Red Poll	5,400¼	4·71	254·68	290¾
32	Panama	..	Department of Agriculture	,, ..	5,869	4·23	248·45	283¼
33	Princess of Tarnpirr ..	2986	C. G. Knight ..	Jersey ..	4,835	5·09	246·26	280¾
34	Carribea	..	Department of Agriculture	Red Poll	5,518	4·29	236·92	270
35	Sylvia	..	Department of Agriculture	,, ..	4,899	4·78	234·43	267¼
36	Lizzie VI. of Melrose ..	..	W. Woodmason ..	Jersey ..	5,082	4·60	234·22	267
37	Madge	3575	Mrs. A. Black ..	,, ..	4,624½	5·04	233·04	265½
38	Roseneath Sylvia ..	3776	A. Box	,, ..	4,805	5·39	232·29	264¾
39	Sweetheart of Tarnpirr ..	2987	C. G. Knight ..	,, ..	5,056	4·55	231·08	263¼
40	Princess Edith of Gowrie Park	2676	Geelong Harbor Trust	Ayrshire ..	5,488½	4·19	229·85	262
41	Japana	..	Department of Agriculture	Red Poll	6,568	3·50	229·74	262
42	Dolly of Clydebank II. ..	3742	Mrs. A. Black ..	Jersey ..	3,596	6·32	227·46	259¼
43	Hyacinth of Springhurst ..	3705	J. D. Read ..	,, ..	3,713	5·89	218·74	249¼
44	Bridesmaid of Tarnpirr ..	2981	C. G. Knight ..	,, ..	4,634½	4·56	212·24	242
45	Molly III. of Banyule ..	3624	C. G. Lyon ..	,, ..	3,790	5·59	211·85	241¼
46	Shamrock of Springhurst ..	3708	J. D. Read ..	,, ..	4,005¼	5·14	209·12	238¼
47	Tennessee	..	Department of Agriculture	Red Poll	5,075¼	4·09	207·77	236¾

Heifers—175 lbs Standard.

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat	Butter.
					lbs.		lbs.	lbs.
1	Lady Grey I. of St. Albans	Not yet allotted	A. W. Jones ...	Jersey ..	5,255	6·61	347·36	396
2	Chevy VIII. of Melrose ..	..	W. Woodmason ..	,, ..	6,011	5·63	338·56	386
3	Jessie XIII. of Melrose ..	..	W. Woodmason ..	,, ..	5,261½	6·21	327·17	373
4	Handsome Girl VII. of Melrose	..	W. Woodmason ..	,, ..	4,829	6·63	320·63	365½
5	Creambread	..	C. D. Lloyd ..	,, ..	5,203	5·97	310·81	354¼
6	Jessie XII. of Melrose ..	..	W. Woodmason ..	,, ..	5,063½	5·99	303·21	345¾
7	Molly IV.	..	C. G. Lyon ..	,, ..	5,622	5·38	302·28	344¾
8	Dainty VI.	..	T. Harvey ..	,, ..	5,306	5·66	300·33	342¼
9	Edith II. of Melrose ..	..	W. Woodmason ..	,, ..	5,418	5·48	296·69	338¾
10	Graceful Duchess XI. of Melrose	..	W. Woodmason ..	,, ..	4,470½	6·02	269·29	307

HEIFERS—175 LBS. STANDARD—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
11	Lady Elector II. of Melrose	..	W. Woodmason ..	Jersey ..	4,421½	5·94	262·85	299¾
12	Pearl III. of Melrose ..	..	W. Woodmason ..	,, ..	4,016½	6·49	260·62	297
13	Gaiety Girl VIII. of Melrose	..	W. Woodmason ..	,, ..	4,759	5·39	256·53	292½
14	Lady Marge IV. ..	..	T. Harvey ..	,, ..	4,718½	5·43	256·21	292
15	Brownbread	..	C. D. Lloyd ..	,, ..	3,936½	6·32	248·70	283½
16	Fuchsia X. of Melrose ..	..	W. Woodmason ..	,, ..	5,503	4·51	248·39	283¼
17	Princess Defiance of Springhurst	..	J. D. Read ..	,, ..	4,528½	5·45	246·89	281½
18	Daisy VI. of Melrose ..	..	W. Woodmason ..	,, ..	4,699¼	5·14	241·83	275¾
19	Arum of Springhurst ..	..	J. D. Read ..	,, ..	4,529½	5·34	240·26	274
20	Fuchsia XI. of Melrose ..	..	W. Woodmason ..	,, ..	4,134	5·64	233·54	266¼
21	Waverley Lass II. of Melrose	..	W. Woodmason ..	,, ..	3,845½	6·06	233·37	266
22	Bridesmaid of Tarapirr ..	2081	C. G. Knight ..	,, ..	4,676	4·85	226·60	258¼
23	Alice of Tarnpirr ..	..	C. G. Knight ..	,, ..	3,870	5·80	224·60	256
24	Sweet Pansy II. of Melrose	..	W. Woodmason ..	,, ..	3,850½	5·73	220·82	251¾
25	Balsam of Springhurst ..	..	J. D. Read ..	,, ..	4,221	5·21	220·02	250¾
26	Gipsy Maid II. of Sparrovale	2511	Geelong Harbor Trust	Ayrshire ..	4,916	4·40	216·12	246½
27	Lass' Favourite ..	..	A. Box	Jersey ..	4,881½	4·42	215·82	246
28	Honeysuckle of Springhurst	..	J. D. Read ..	,, ..	4,053½	5·22	211·82	241½
29	Musk of Springhurst ..	..	J. D. Read ..	,, ..	3,700½	5·56	205·95	234¾
30	Soudana	..	Department of Agriculture	Red Poll	4,707	4·40	207·17	236¼
31	May's Gem	..	A. Box	Jersey ..	4,176½	4·91	205·29	234
32	Roseneath Twylish ..	..	A. Box	,, ..	3,884	5·21	202·58	231
33	Boronia of Springhurst ..	..	J. D. Read ..	,, ..	4,031	5·00	201·67	230
34	Laurel	..	Department of Agriculture	Red Poll	5,006½	4·02	201·41	229½
35	Ontario	..	Department of Agriculture	,, ..	4,739	4·21	199·68	227½
36	Lassie III. of Banyule ..	3620	C. G. Lyon ..	Jersey ..	3,980	5·01	199·36	227¼
37	White Bell II.	3728	C. E. Wood ..	,, ..	3,333	5·94	198·01	225¾
38	Itala	..	Department of Agriculture	Red Poll	4,695	4·14	194·30	221½
39	Russia	..	Department of Agriculture	,, ..	4,933	3·82	188·69	215
40	Pacifica	..	Department of Agriculture ..	,, ..	3,868½	4·76	184·02	209¾
41	Serbia	..	Department of Agriculture	,, ..	4,271	4·22	179·79	205

HERD AVERAGES.

W. WOODMASON'S "Melrose" Herd.

Cows of Herd in their Respective Classes.		Butter Fat.	Average.
		lbs.	
28 Mature Cows yielded	.. ..	10,920·34	390·01
9 Second-calf Cows yielded	3,021·65 lbs.	..	335·74
Handicap of 50 lbs. each	450·00 lbs.		
		3,471·65	
14 Heifers yielded	3,813·50 lbs.	..	272·39
Handicap of 75 lbs. each	1,050·00 lbs.		
		4,863·50	
Return without herd allowance		19,255·49	377·56
51 Cows in herd allowed 25½ lbs. each (equal to ½ lb. per cow)		1,300·50	
Herd total, including all handicap allowances		20,555·99	403·05

C. G. LYON'S "Banyule" Herd.

Cows of Herd in their Respective Classes.		Butter Fat.	Average.
		lbs.	
9 Mature Cows yielded	.. ..	3,523·37	391·48
3 Second-calf Cows yielded	957·76 lbs.	..	319·25
Handicap of 50 lbs. each	150·00 lbs.		
		1,107·76	
2 Heifers yielded	501·64 lbs.	..	250·82
Handicap of 75 lbs. each	150·00 lbs.		
		651·64	
Return without herd allowance		5,282·77	377·33
14 Cows in herd allowed 7 lbs. each (equal to ½ lb. per cow)		98·00	
Herd total, including all handicap allowances		5,380·77	384·33

DEPARTMENT OF AGRICULTURE, Research Farm Herd.

Cows of Herd in their Respective Classes.		Butter Fat.	Average.
		lbs.	
25 Mature Cows yielded	.. ..	7,778·88	327·32
13 Second-calf Cows yielded	3,453·53 lbs.	..	265·65
Handicap of 50 lbs. each	650·00 lbs.		
		4,103·53	
8 Heifers yielded	1,516·85 lbs.	..	189·60
Handicap of 75 lbs. each	600·00 lbs.		
		2,116·85	
Return without herd allowance		13,999·26	304·33
46 Cows in herd allowed 23 lbs. each (equal to ½ lb. per cow)		1,058·00	
Herd total, including all handicap allowances		15,057·26	327·33

J. D. READ'S "Springhurst" Herd.

Cows of Herd in their Respective Classes.		Butter Fat.	Average.
		lbs.	
15 Mature Cows yielded	.. ..	4,494·83	299·65
2 Second-calf Cows yielded	427·86 lbs.	..	213·93
Handicap of 75 lbs. each	150·00 lbs.		
		577·86	
8 Heifers yielded	1,610·61 lbs.	..	201·32
Handicap of 75 lbs. each	600·00 lbs.		
		2,210·61	
Return without herd allowance		7,283·30	291·33
25 Cows in herd allowed 12½ lbs. each (equal to ½ lb. per cow)		312·50	
Herd total, including all handicap allowances		7,595·80	303·83

NOTES ON PORTUGUESE VINE VARIETIES.

By F. de Castella, Government Viticulturist.

(Continued from page 408.)

Bastardo and Touriga, which will form the subject of the next articles differ widely from one another and from Alvarelhão (described in last issue). The last named appears to be mainly responsible for the curious "dry finish" of a high grade Port, but this is only one of the characteristics of this remarkable wine. The special character of its bouquet and its flavour seem to be largely dependent on Bastardo, whilst Touriga is of, perhaps, equal importance in the direction of colour and body. It is the judicious combination and treatment of the fruit of these three, and of several other sorts to be described later, which result in what is known the world over as Port wine.

These three sorts differ from each other to such an extent as to really constitute three distinct types, to one or other of which each of the other varieties used in the making of Port may be said to belong.

Bastardo.

This variety seems to be responsible for several of the leading features of Port, more especially of the lighter-coloured type known as tawny Port. The wine yielded by Bastardo, like that of Grenache, contains a considerable percentage of alcohol. It is also remarkable for the instability of its colour, rapidly developing the tawny or onion-peel tint as it is termed in France, and the peculiar character known as the "rancio" taste. The small extent to which Grenache is grown on the Douro is perhaps explained by the fact that Bastardo possesses several of its leading peculiarities. Bastardo ripens earlier than Grenache; perhaps, too early, in fact, for northern Victoria. This is a question which can only be answered by practical trial on a large scale, which must also decide as to whether and to what extent the one sort can replace the other in order to communicate a tawny colour and "rancio" taste to wines of Port type.

Bastardo is one of the oldest Portuguese varieties, it is mentioned as long ago as 1532 by Ruy Fernandez* as entering into the composition of a marvellous wine. Vincencio Alarte† speaks of Bastardo as a very good grape, excellent to eat, and which, though poor in colour, softens the wine marvellously by its excellent sweetness, and gives its much freshness (*novidade*, literally novelty).

Rebello da Fonseca (1791) refers to Bastardo as softening the roughness of Alvarelhao and other grapes (see last issue). He deals with the curious fallacy that Bastardo should be identical with Pinot of Burgundy and Champagne, a subject mentioned by other Portuguese writers. The two sorts are really very different, and it is difficult to find how the idea originated. The supposed similarity led to a trial which he describes as follows:—

"On 21st December, 1789, I tasted a wine that Jose João Pinto de Queiroz e Figueiredo, Chief Captain of Penaguião, had ordered to be made, the previous year, in imitation of Champagne, extracted from Bastardo grapes without any

* An interesting description of agriculture in the neighbourhood of Lamego, a town situated about the middle of the Douro Valley.

† Pseudonym, adopted by Sylvestre Gomes de Moraes, who published a work on Portuguese Viticulture in 1711.

mixture, and I found it much superior to all that were tasted—even to Champagne."

Seeing that the wine was only a year old this confirms the rapid maturation of the wine made from Bastardo. Fonseca further states:—

"This variety produces much in all classes of soil but as its grapes are very subject to dry up and also to rot, a year seldom occurs in which they can be

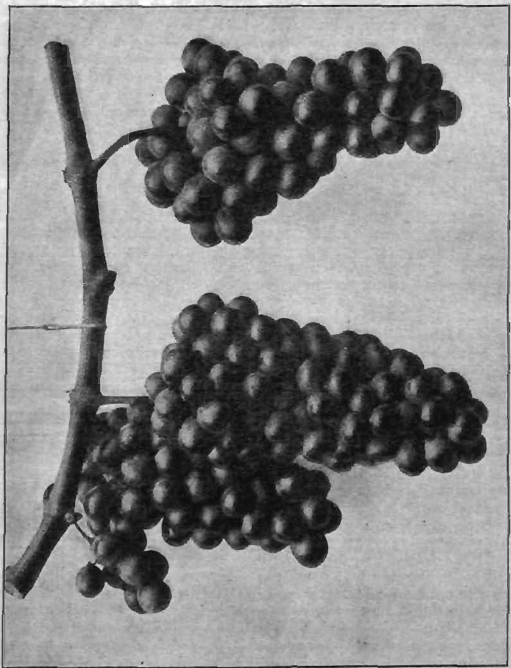


Fig. 5.—Bunches of Bastardo Grapes.
Reproduced from *O Portugal Vinicola*, by B. C. Cincinnato da Costa, reduced to half natural size.

vintaged in perfection; besides this defect they have another, *viz.*, that if crushed alone, or even if present in great proportion, they are not capable of yielding a wine of much duration; the wines of Gaivosa, on the Alto Douro, in which there is a large proportion of Bastardo, are choice (*finos*), delicate, of an exquisite flavour and excellent bouquet, but nevertheless they are poor in colour and body, and do not keep so well as others of the Alto Douro; in the trade they are not classed as wines of colour and body, even though they contain a fair proportion of Alvarelhão and other sorts."

Gyrao (1822) also mentions Bastardo as producing a good wine of little colour—

"On stiff soil it rots easily, on hot hillsides it dries up; hence it is only suitable for soils of medium strength on the flanks of the higher hills (*Nas encostas dos montes*). . . . Bastardo gives a wine of the most delicate flavour; for this reason everybody buys it to eat, nevertheless its wine is soft (*molle*) and of very little colour, for which reason only a portion of it should enter into a wine."

According to the same author, Bastardo would seem to be a good variety for making white Ports—

"From nearly all the vineyards of Penaguiao, especially the older ones where there is much Bastardo, a great quantity of wine could be obtained similar to the Tokay of Hungary, which finds its way to Odessa in small quantities, as it has to make the transit by land. This wine is much appreciated there, and if

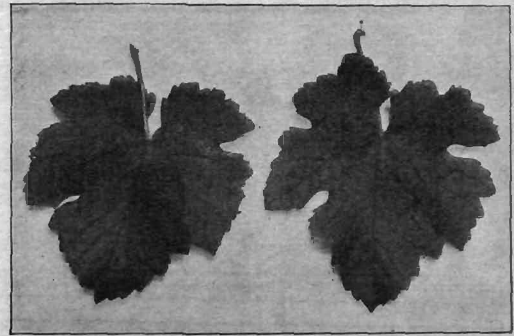


Fig. 6.—Leaves of Bastardo (about one-third natural size).

Photo. taken at Quinta da Boa Vista, Alto Douro, Portugal, in October, 1907.

the owners of Penaguiao were to produce something similar, well and judiciously made, it could also be sold, perhaps even in England, at 100,000 reis per pipe."

The Visconde de Villa Maior (1865-9) has written a good deal concerning this vine.

"At Vesuvio it is planted separately, as it should be, on account of its being very early in its ripening. It ought to be before other varieties and separately as a special wine."

He enumerates the leading vineyards in which it is largely grown, stating that it is well known throughout the whole of Portugal as being the earliest of those grapes which are suitable for table purposes, ripening in most seasons in the beginning of July. It is also the basis of a specially choice wine which completes and perfects itself at a very early age. He describes two sub-varieties of this vine which are held in little esteem as being inferior and semi-sterile. This seems to indicate that Bastardo is a variety prone to deterioration, and which is capable of

improvement by rigorous scion selection. He quotes Rebello da Fonseca as follows:—

"It must be borne in mind that the wines of Baixo Corgo are mainly made of Bastardo and Alvarelhão; in addition to these, throughout the Douro, special wines are made from this grape (Bastardo); they are liquorous, sweet, and very choice. Those of Lavradio are also made with Bastardo in large proportion."

The wine of Bastardo appears to be prone to fermentation troubles, according to several different writers.

Conselheiro Aguiar (1866) states that:—

"The must is thick and fermentation tumultous and protracted. It is deficient in colour and body, and produces an over-ripe wine."

Ferreira (1866) states that:—

"At Barreiro, Bastardo must for a special wine had a sugar strength of 32 per cent. (genuine alcohol strength 15.6 per cent.)* In this locality the sweeter the grapes the longer the fermentation which is given to the must. With Bastardo, for example, if it is not allowed to remain for eight days fermenting on the skin, it turns and is spoilt."

Apparently fearing that he might disparage the wines of the district, he naïvely adds—

"Nevertheless, neither this nor the other wines of the locality are harsh (*saem travenlos*), rather are they suave and soft, which is to be explained very naturally, owing to the influence of the sunlight, which causes the skin to lose the bitterness of the tannin."

Figueiredo (1875) states that Bastardo produces a generous wine, only slightly astringent, remarkably aromatic, though little charged with colour. It requires very thorough trampling and long fermentation. In Beira Alta there are two varieties of this vine which produce a balsamic and generous wine, which forms the best blend possible with Tourigo and Alvarelhão.

That Bastardo must is remarkable for high gravity is shown by the determinations cited by the following authors:—

Ferreira Lapa (1866)—32 per cent. sugar (16.8 Beaumé).

Conselheiro Aguiar (1866)—33.18 per cent. sugar (17.5 Beaumé), acid 0.47 per cent. (as sulphuric).

Villa Maior (1875)—S.G. 1.140—acid O. 23 per cent. (as sulphuric).

Dr. Alberto Sampaio (1878)—mentions that the gravities of Bastardo must were as follow:—12° B. in 1873, 14° in 1874, and 15°† in 1875.

Several authorities consider it to be very liable to Oidium. D. Fernando de Sousa Coutinho states that near Lisbou it is attacked by Anthracnosis, but not with much intensity.

The following information is abridged from the article on Bastardo by Sr. Cincinnato da Costa in O Portugal Vinicola:—

"Bastardo is one of the most widespread Portuguese varieties. It is a black grape, especially remarkable for its high sugar strength and the delicacy of its perfume. It is cultivated in nearly all the different viticultural regions of Portugal, and always influences in a marked manner the quality of the wines into the composition of which it enters.

"On the Douro Bastardo is almost always associated with Alvarelhão, the two constituting the basis of the best vineyards where the excellent wines of Porto are produced; it is everywhere treated as a choice variety worthy of the best attention of vine growers.

"At Lavradio, near Lisbon, the same vine appears to be cultivated under the name of Bastardino. It seems here to be slightly different in appearance, no doubt owing to altered surroundings, both bunch and berry being rather smaller.

* Absolute alcohol, by volume.

† The Beaumé strengths given in brackets have been worked out from the sugar strengths according to the usual French tables.

"Villa Maior is quoted as stating that Bastardo yields 51.8 per cent. of choice must, lightly rose-coloured, of density 1.140 (17 deg. 7 Beaumé), containing 29.285 per cent. sugar and 0.23 per cent. acid. Sr. da Costa quotes somewhat different percentages.

"Bastardo crushed alone produces a generous wine, very agreeable and of great flavour (*Grande flavor*), a wine which as a rule ages early, attaining at the end of two years the characteristic colour of onion peal. Under the microscope the must, which is of rosy colour, shows a very considerable number of ferments, the cells being turgid and very active."

Sr. Duarte de Oliviera contributes a long and interesting article concerning this variety to *Ampelographie*,* in which, in addition to quoting a good deal of what we have reproduced above, he gives the following information:—

The curious confusion between Bastardo and Pinot is dealt with, it being pointed out how Villa Maior corrected the error—

"Bastardo became included among the Douro varieties without it being possible to say whence it came or why it bears its present name. It has no *analogy with foreign sorts, and in our ignorance concerning its origin we are* forced to admit that it must be Portuguese; if it is truly so, it is the richest gem in the Portuguese œnological crown, because it is to it especially that Port *wine owes its world-wide reputation.*

"Though widely distributed throughout Portugal, and everywhere appreciated, it was on the Douro that it played the largest part in the making of wine. In such celebrated vintages as 1834 and 1846 the presence of this grape can be recognised as soon as the bottle is uncorked, even by those who are not professional wine tasters.

"Since the reconstitution of the vineyards, Bastardo has not played so large a part as it formerly did, especially in the hotter parts of the Douro, where the warm sun causes it to shrivel, even before vintage. The neglect of this most valuable vine is deplored, but it is recognised that it was inevitable, since the yield cannot be relied upon—capricious in its production and unable to withstand either thick fogs or the ardent rays of the midsummer sun, the vats would remain almost empty if other comrades more common (*Bourgeois*), but more generous, did not often save the situation. Therefore, on the Douro, in all very sunny aspects, Bastardo has been shown the door; but we must state that no one dares to say, or even to think, that it ought not to co-operate, as formerly, in the making of the great wines. Bastardo is not wanted, but a good souvenir is retained of it. Bastardo has been the great variety which has made the reputation of Port wine.

"Except in Minho (northern Portugal), *where it is pruned long, it is usually* pruned short. Thus treated, and grafted on vigorous stocks, the bunches are larger than they would otherwise be.

"*Bastardo comes into leaf about the same time as other sorts usually grown.* Though always an early sort, since it has been grafted on resistant stocks it is even earlier. It is this earliness which is causing it to disappear altogether *from the Douro. It also causes it to fall a prey to birds and insects;* thrushes in particular do much damage to its fruit. It is a very vigorous vine, and the stem becomes enormous; it resists downy mildew fairly well, but suffers much from Oidium, especially in moist situations.

"Fermentation troubles similar to those referred to by older authorities are mentioned. The fermentation of this grape is exceedingly lazy, extraordinarily slow of accomplishment. Even though the grapes be not over-ripe, the must is always thick and viscous; it is necessary to wait several days and to stir frequently in order to bring the wine to 0 deg. Beaumé, so as to make a table wine. In the case of conversion into Port the vat is racked at 5 deg. or 6 deg. Beaumé. Fermentation then proceeds quicker, because the most difficult stage is the reduction of the gravity from 5 deg. to 0 deg., especially when the original gravity of the must was greater than 12 deg. or 13 deg., as it frequently is at Traz os Montes, and very common with second and third grade wines on the Douro.†

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* Edited by M.M. Viala and Vermorel.

† It is worthy of note that very high Beaumé strength is not considered necessary for the choicer Ports. This is in agreement with the criticism of Australian wines of Port type, by competent wine judges, as being excessively sweet.

"Thus treated, wines result which are rich in sugar, fruity, and preserve a delicate bouquet. As regards Beaumé strength, Bastardo heads the list of red grapes just as *Gouveio* does that of white. Both these sorts should enter into the making of the best Ports, as they formerly did, because they give regularly musts of an average of 15 deg. Beaumé.

"Bastardo is in some districts grown as a table grape on account of its very early ripening.

"The following is the Ampelographical description given by Sr. Duarte de Oliviera:—

Vine.—Strong; stem cylindrical; bark reddish-brown; adherent, detaching in short strips.

Buds.—Large, swollen, stumpy, with large thick scales; young leaves yellowish-green above, silky-white with small prominent veins beneath.

Canes.—Strong, cylindrical, erect, with reddish sepia striations; internodes of very variable length (6 to 12 cm.),* but rather short than long; knots small; tendrils numerous, short, stout.

Leaves.—Large, as broad as long, of medium thickness, soft, light-green and glabrous above, light silky tomentum and paler colour beneath; five-lobed; upper lateral sinus of little depth, narrow and sometimes closed; lower lateral sinus generally not very marked; petiolar sinus deep, closed or almost closed by the two lobes which overlap; veins prominent; teeth large, *alternate*; those at the extremity of the lobes always more developed; stalk long and of medium thickness. Some days before vintage the leaves assume a reddish tint, in a similar way to the French Teinturier (Tinto), though much less intense.

Fruit.—Bunches numerous, small, medium to large on vigorous stocks; cylindro-conical, often with short wings; capable of shrivelling (becomes raisins) in the sun in a dry season; stalk very short, upper half woody; pedicels thick, very short, with a large swelling; brush (core) short, red in the centre, and detachable with difficulty; berries ellipsoidal, exceedingly tight, superimposed and sometimes flattened by compression; black, with glaucous reflections; flesh juicy, crisp, very sweet, and agreeable to the palate; skin hard; pips per 100 berries—20 with one, 52 with two, 24 with three, and 4 with four each."

* Equal to 2·3 to 4·7 inches.

(To be continued.)

LUCERNE FOR HORSES.

According to information gained by the Kansas Agricultural College, and detailed in a bulletin on the subject, there seems to be an almost universal opinion among horsemen, and especially among those that are raising heavy horses, that no grass or combination of grasses equals or even approaches the value of lucerne, alfalfa as it is called, as a pasture for horses. It is maintained that from an economical point of view it has no equal, as it will furnish so much more feed per acre than any other grass. It will not only pasture more horses, but it will produce horses of greater weight, larger bones, and stronger muscles. "A horse that has been reared in an alfalfa pasture and fed a light ration of alfalfa pasture, all winter," says the bulletin, "makes one of the finest horses to be found in any market to-day. To produce a horse of the highest type, with the cleanest bone, the best-developed muscle, the best temperament, and the greatest action and finish, nitrogenous feed must be used, and in no other feed can this most essential element be found more cheaply than in lucerne."

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917.

Commenced 15th April, 1916; concluding 14th April, 1917.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

CONCLUSION OF WINTER TEST.

LIGHT BREEDS.

WET MASH.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.7.16	15.7.16 to 15.8.16	Total to Date (Four months).	Position in Competition.
7	C. J. Jackson	White Leghorns	367	114	481	1
1	G. McDonnell	"	344	129	473	2
25	A. H. Mould	"	356	112	468	
13	H. J. Meaddows	"	347	119	466	4
10	J. H. Duncan	"	317	140	457	5
40	A. Brandrett	"	353	98	451	6
36	E. W. Hippe	"	343	108	451	
27	John Blacker	"	343	103	446	8
41	Excelsior Poultry Farm	"	327	117	444	9
24	H. N. H. Mirams	" (5 birds)	323	120	443	10
22	Mrs. H. Stevenson	"	317	123	440	11
38	V. Little	"	322	110	432	12
28	S. Cheatle	R.C.B. Leghorns	322	105	427	13
37	J. M. Smith	White Leghorns	330	90	420	1
17	W. G. Swift	"	338	82	420	
15	G. Laughlan	"	289	122	411	16
23	T. A. Pettigrove	"	297	111	408	17
44	J. Jamieson	"	305	98	403	18
45	C. H. Oliver	"	272	127	399	19
30	F. T. Denner	"	283	112	395	20
3	W. M. Bayles	"	271	122	393	21
14	W. R. Hustler	"	285	107	392	22
34	F. G. Silbereisen	"	285	99	384	23
32	N. Burston	"	254	123	377	24
18	C. Ludwig	"	273	103	376	25
39	L. McLean	"	248	113	361	26
16	F. Collings	"	286	70	356	27
26	Mrs. A. Dumas	" (5 birds)	274	81	355	28
6	J. J. West	"	236	119	355	
12	G. Rayman	"	250	89	339	30
29	A. S. Hyndman	"	236	96	332	31
101	A. E. Silbereisen	"	214	115	329	32
11	R. W. Pope	"	262	66	328	33
8	E. A. Lawson	"	206	105	311	34
19	Benwerren Egg Farm	"	205	97	302	35
43	S. Buscumb	"	206	92	298	36
5	W. G. Osburne	"	205	84	289	37
42	Thirkell and Smith	" (5 birds)	205	64	269	38
20	H. Merrick	"	182	66	248	39
35	Tom Fisher	"	177	65	242	40
33	E. F. Evans	"	150	80	230	41
9	W. H. Clingin	"	113	112	225	42
4	Fulham Park	"	90	79	169	43
31	J. H. Gill	"	82	53	135	44
		Total	11,690	4,440	16,130	

HEAVY BREEDS.

DRY MASH.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.7.16	15.7.16 to 15.8.16	Total to Date (Four months).	Position in Competition.
98	Marville Poultry Farm	Black Orpingtons	370	139	509	1
97	D. Fisher	"	342	143	485	2
100	Oaklands Poultry Farm	"	321	143	464	3
94	Mrs. M. Coad	"	273	111	384	4
95	T. W. Pearce	"	232	114	346	5
96	H. Hunt	"	137	143	280	6
99	J. Ogden	"	90	91	181	7
		Total	1,765	884	2,649	

Sixth Victorian Egg-Laying Competition, 1916–1917—*continued.*

Conclusion of Winter Test—*continued.*

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.7.16.	15.7.16 to 14.8.16	Total to Date (Four months).	Position in Competition.
		LIGHT BREEDS.				
		Dry Mash.				
46	W. H. Robbins ..	White Leghorns ..	410	135	545	1
59	T. A. Pettigrove ..	" ..	405	131	536	2
56	Mrs. Nicoll	" ..	367	126	493	} 3
52	W. J. Thom	" ..	354	139	493	
53	W. N. O'Mullane ..	" ..	347	123	470	5
70	G. Wilkinson	" ..	335	130	465	6
61	C. C. Dunn	" ..	363	91	454	7
58	C. Ludwig	" ..	343	105	448	8
65	Izard and Tierney ..	" ..	334	97	431	9
54	Mrs. A. O. Hughes ..	" ..	349	79	428	10
47	H. McKenzie and Son ..	" ..	291	136	427	11
62	J. W. Morrow	" ..	320	100	420	12
48	Thirkell and Smith ..	" ..	267	107	374	13
69	E. A. Lawson	" ..	240	124	364	14
60	A. Greenhalgh	" ..	265	94	359	15
55	Rev. J. Mayo	" ..	246	111	357	16
67	Lysbeth Poultry Farm ..	" ..	233	106	339	17
49	C. Lane	" ..	265	65	330	18
63	N. Burston	" ..	159	137	296	19
51	Reliable Poultry Farm ..	" ..	204	80	284	20
50	Clevedon Poultry Farm ..	" ..	179	97	276	21
66	Benwerren Egg Farm ..	" ..	140	115	255	22
64	A. Bennett	" ..	233	17	250	23
68	W. G. Osburne	" ..	93	79	172	24
		Total ..	6,742	2,524	9,266	
		HEAVY BREEDS				
		Wet Mash.				
74	Oaklands Poultry Farm ..	Black Orpingtons ..	414	156	570	1
89	Brooklyn Poultry Farm ..	" ..	396	126	522	2
87	S. Buscumb	" ..	353	124	477	3
92	J. H. Wright	" ..	324	152	476	4
85	Mrs. M. Coad	" ..	328	138	466	5
83	L. McLean	" ..	327	126	453	6
86	C. Ludwig	" ..	315	135	450	7
88	A. D. McLean	" ..	313	135	448	8
80	Mrs. M. Pearce	" ..	315	132	447	9
72	Marville Poultry Farm ..	" ..	334	107	441	10
93	L. W. Parker	" ..	303	118	421	11
90	Excelsior Poultry Farm ..	" ..	246	125	371	12
78	Reliable Poultry Farm ..	" ..	245	113	358	13
91	N. Papayanul	" ..	206	147	353	14
81	K. Courtenay	Faverolles ..	271	71	342	15
77	Mrs. G. R. Bald ..	White Plymouth Rocks	217	123	340	16
79	Stranks Bros.	White Orps., 4 birds	287	40	327	17
73	E. W. Hippe	Rhode Island Reds	189	112	301	18
84	H. L. Trevana	" ..	177	111	288	19
76	L. A. Erry	Silver Wyandottes	134	139	273	20
71	C. E. Graham	Black Orpingtons ..	135	132	267	21
75	Mrs. Drake	Rhode Island Reds	108	94	202	22
82	J. Ogden	Black Orpingtons ..	71	130	201	23
		Total ..	6,008	2,786	8,794	

Report for Month ending 14th August, 1916.

The weather conditions for the month were seasonable, with heavy winds, varied by occasional frosts and fine days. Several of the heavy breeds showed signs of broodiness; but owing to the time of the year they soon started to lay again.

This year the heavy breed sections are a great improvement on previous years, both in point of quality and egg production; this verdict is borne out by the fact that the world's record for a winter test for all breeds, both light and heavy, has been broken by a pen of six Black Orpingtons, owned by the Oaklands Poultry Farm, which laid 570 eggs, an average of about 5½ eggs per week for each bird during the four months 15th April to 14th August. Brooklyn Poultry Farm, with a score of 522, obtained second place.

Mr. W. H. Robbins's pen of White Leghorns secured first prize in the winter test for light breeds, with a score of 545 eggs to its credit, while Mr. T. A. Pettigrove's pen was second, with a total of 536 eggs.

The rainfall for the month was 65 points. Temperature—lowest, 32°, highest, 65°.

A. Hart,
Chief Poultry Expert.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Spraying.

The peach aphis will now have made its appearance in orchards which were not sprayed with the red oil emulsion in the winter. The tobacco solution will now be required, and this may be sprayed on as strongly as the grower wishes. If possible, a second spraying should be repeated quickly after the first operation, so as to kill any aphides previously protected by the others, or any that may have only been weakened by the first operation.

The time has also arrived when spraying is needful for the prevention of all fungus diseases, such as shothole or scab, black spot, leaf rust, leaf curl, &c. In the case of these pests, "prevention better than cure" is the invariable rule; and to delay beyond the correct period the application of the necessary sprays is to court disaster. For black spot of the apple and pear, the spraying should be performed as soon as the earliest flowers are opening. For shothole and scab the time to spray is before the flower petals expand; and the spraying may be repeated, if necessary, after the fruit has set.

For rust and leaf curl the spray should be applied before any sign of the trouble appears on the foliage; thus, if the fungus were present during the previous season, it will be necessary to spray early to combat it successfully.

The basis of all the successful fungicides is sulphate of copper or bluestone. Bordeaux mixture (a mixture of bluestone, lime, and water, known as the 6.4.40 formula), is used; the materials and quantities being 6 lbs. bluestone, 4 lbs. lime, and 40 gallons water.

Another spray, and in some locations equally successful in its results as the Bordeaux mixture, is the copper-soda spray, the proportions being 6 lbs. bluestone, 8 lbs. washing soda, and 40 gallons of water. In each case the materials should be separately dissolved, and then evenly and simultaneously mixed in a third vessel.

It is very urgent that the lime should be thoroughly fresh and quick, otherwise the spray mixture will give very inferior results. A second necessary point is that the copper sprays should be used as soon as they are made. Where the grower does not wish to make his own spray, there are quite a number of ready-made Bordeaux pastes and Bordeaux mixtures already on the market, which can be used with satisfactory results. In fact, the use of these has become fairly general, and it is not now the practice for growers to make their own sprays.

GENERAL.

It is most important that ploughing should be completed as early as possible. In the past, it has very frequently happened that, owing to delaying the ploughing, the orchard and the fruit crop have both suffered very considerably. It is absolutely necessary to cultivate the surface early, to take advantage of the moist surface and consequent easy ploughing; and also to conserve as large an amount of moisture in the soil as possible. The longer the ploughing is delayed, the less amount of moisture is retained in the soil for summer use. Deferred ploughing certainly means dry soil, enfeebled trees, and diminished results. Early ploughing gives exactly opposite results; the earlier the ploughing, the more soil water is conserved.

When the ploughing is completed, the clods should be crushed, and the land harrowed, so that a fine earth mulch may be obtained. The orchard surface should be kept as level as possible, and no irregular ridging or furrows should be allowed.

All cover crops planted to supply humus to the soil should now be ploughed in. If the plants are of a leguminous nature, the best time to plough these in is when they are in full flower. If the growth has been at all excessive or rank, the crop may be rolled before ploughing; or it may be cut or mowed with a mowing machine. Every care should be taken that the plants should be distributed evenly over the ground, and large quantities in a mass should not be ploughed under. Artificial and stable manures may also be given to the trees at this time. These should be applied before ploughing.

GRAFTING.

The work of grafting should be completed early in the month. The most useful method of reworking old trees is to cut the head right off, leaving only the stump. Then grafts can be put in according to the fancy of the grower. The old method of cleft grafting has been superseded by the bark or crown graft. The latter method does not cause any damage to the wood and thus, with care, no rotting can take place. The best method of bark grafting is the saddle graft; that is, the graft is inserted in the bark and a strip of bark is carried right across the trunk and inserted in the bark on the opposite side. This method is much slower than the ordinary bark graft, but it insures a much quicker healing over the old stump.

Vegetable Garden.

The vegetable plots should be cleaned from all weeds, having the light weeds dug in and the stronger ones pulled out and rotted in the compost heap. The surface should be worked up to a very fine tilth after digging; it must be kept constantly loose with the hoe to keep the

soil cool; and prior to digging it will be advantageous to give a top dressing of lime.

If the weather be dry or windy, all newly-planted plants should be frequently watered. In transplanting seedlings, it is a help to dip the whole plant in water before planting.

Any seedlings that are ready may be planted out; tomato plants may be planted out under shelter until the frosts are over. At the end of the month a sowing of French bean seeds may be made. Seeds of peas, broad beans, and beet, cabbage, khol-rabi, and radish, turnip, cauliflower, lettuce, carrot, parsnip, &c., may be sown in the open. Seeds of melons, cucumbers, pumpkins, marrows, and similar plants may be planted in frames for transplanting after the frosts have gone.

Flower Garden.

After digging, the surface must be kept constantly stirred with the hoe, so as to have it loose and friable for cooling and for moisture-conserving purposes. All weeds must be kept down, as they are robbers of plant food and moisture at this season of the year. Shrubs of all kinds may still be planted out, and these should be well watered after planting. Rose and other aphides must be watched for, and sprayed when they appear. Rose scale should be sprayed with lime sulphur wash or with kerosene emulsion. This pest will soon disappear if the bushes are kept open to admit the air and the sunlight freely. Rose mildew will now be appearing, and the plants, as well as the soil, should be sprinkled with liberal dustings of sulphur. Sulphide of potassium is also a good specific for this fungus trouble, using it at the rate of 1 oz. to 3 gallons of water.

Cannas, early chrysanthemums, and early dahlia tubers may be planted out, as well as all kinds of herbaceous plants, such as delphinius, perennial phlox, asters, &c. These clumps should be well divided, and in planting they should be fed with a liberal quantity of stable manure. Beds should be prepared and well dug over for exhibition chrysanthemums and dahlias.

REMINDERS FOR OCTOBER.

Live Stock.

HORSES.—Continue to feed stabled horses well, add a ration of green-stuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old or badly-conditioned horses liberally. If too fat, mares due to foal shortly should be put on poorer pasture. Mares with foals at foot should receive a good ration of oats daily. Those intended for breeding, if not already stinted, should be put to the horse. Colts not intended to be kept as stallions should be gelded. Working horses due for a spell should be turned out to grass.

CATTLE.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw, if possible, to counteract the effect of green grass. Be prepared for milk fever. Read article in *Year-Book of Agriculture,* 1905, page 314. Give calves a warm dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Feed regularly with regard to quantity and time. Give a cup of limewater in the milk to each calf, also place crushed oats or lucerne hay in a trough so that they can eat at will.

PIGS.—Supply plenty of bedding in warm well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them

to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal per 100 lbs. live weight in food daily. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now.

Sheep.—Shear as early as the weather will permit, and avoid the usual excessive dust in travelling to, and yarding at sheds. Burr and seeds collect on the fleeces as well, particularly with lambs, if shearing be left until late in the season. Shear all lambs not fit for export, they thrive better and make more growth through the ensuing summer and autumn. Fleeces from well-bred, good-backed sheep should be skirted with care, the better the class of wool the greater the *necessity. Fleeces that have become dead and earthy on the backs need only* removing the merest stains, there is little advantage in skirting these. It is better management to have ample tables and extra hands skirting closely than to hastily tear off unnecessary wool and then employ men at other tables to sort "broken fleece," "first," and "second" pieces, &c. All stains must be removed from ewes' fleeces, and pizzle stains from the bellies of wethers. Keep separate all coarse fleeces from the finer sorts, and in merinoes the yellow and mushy from the shafty and bright. Skirt all hairy thighs from crossbred fleeces. Avoid sending wool to market in long, round-sided bales, known as "sew-downs." Press in a box press, forming square sides. Brand bales neatly, and not with sheep-branding oil, tar, or paint. Stencil plates and branding ink can be obtained on application to the respective brokers.

Poultry.—The bulk of incubation should cease this month—late chickens are not profitable. Devote attention to the chickens already hatched; avoid overcrowding. Feed with dry mash. Also add plenty of green food to ration, ordinary feeding to be 2 parts pollard, 1 part bran, and a little animal food after the first fortnight. Feed ground grain, such as wheat, hulled oats, maize, and peas, which should be fed in hopper to avoid waste. Grit or coarse sand should be available at all times. Variety of food is important to growing chicks; insect life aids growth. Remove brooders to new ground as often as possible; tainted ground will retard development.

Cultivation.

Farm.—Plant main crops of potatoes in early districts and prepare land for main crop in late districts. Fallow and work early fallow. Sow maize and millets where frosts are not late, also mangolds, beet, carrots, and turnips. Sow tobacco beds and keep covered with straw or hessian.

Orchard.—Ploughing and cultivating to be continued, bringing surface to a good tilth, and suppressing all weeds. Spray with nicotine solution for peach aphis, with Bordeaux mixture for black spot of apple and pear, and with arsenate of lead for codlin moth in early districts.

Vegetable Garden.—Sow seeds of carrot, turnip, parsnip, cabbage, peas, French beans, tomato, celery, radish, marrow, and pumpkins. Plant out seedlings from former sowings. Keep the surface well pulverized.

Flower Garden.—Keep the weeds down and the soil open by continued hoeing. Plant out delphiniums, chrysanthemums, salvia, early dahlias, &c. Prepare ground for digging and manuring for autumn dahlias. Plant gladioli tubers and seeds of tender annuals. Spray roses for aphis and mildew.

Vineyard.—This is the best month for field grafting. If stocks bleed too copiously, cut off 24 hours before grafting. Make sure that scions are fresh. Placing butts in clean water for a few days before grafting is recommended. Field grafts *must* be staked, to avoid subsequent straining by wind and to insure straight stem for future vine. Stakes are also necessary for grafted rootlings for same reasons. Temporary stakes 3 feet long will suffice. Keep a sharp look out for cut worms. (See *Journal* for July, 1911, and also October, 1913.) Disbud and tie up all vines, giving special care to young plantations. Beware of spring frosts. (See *Journal* for September, 1910.)

Conclude spring cultivation (second ploughing or scarifying and digging or hoeing round vines). Weeds must be mastered and whole surface got into good tilth. Sulphur vines when shoots 4 to 6 inches long.

Cellar.—Taste all young wines; beware of dangerous symptoms in unfortified fruity wines, which may need treatment. Fill up regularly all unfortified wines.

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APPLE CULTURE IN VICTORIA.

(Continued from page 532.)

By J. Farrell, Orchard Supervisor.

Propagation of Young Trees.

In starting an apple orchard it is a matter of prime importance to commence with good trees, which should, preferably, be yearling "whip" growths on double-worked blight-proof stocks.

The varieties mostly used for stocks are Northern Spy and Winter Majetin, as they resist the attack of woolly aphis (*Eriosoma lanigera*).

If not worked by the intending planter, early application should be made to nurserymen for the young trees necessary. They should be ordered the season before being required for planting, as it frequently happens that, when orders are delayed, growers experience difficulties in obtaining supplies.

For many years past nurserymen have not been able to meet the annual demand for popular varieties. The placing of early requisitions with the propagators gives them an opportunity to supply the required number of well-worked trees of even standard and good quality.

The variety desired for planting may be either budded or grafted on to stocks produced from root grafts or layers. Seedlings make undesirable stocks because their roots are mostly susceptible to the attack of woolly blight. The use of suckers is also to be deprecated, as they generally throw up other suckers, and particularly when their roots are interfered with during the process of cultivation. This has an injurious effect on the trees, fruit production being reduced while the cost of working the orchard is increased.

DOUBLE-WORKED STOCKS.

A double-worked blight-proof stock consists of two portions of the blight-resistant variety intended for use. A piece of root is employed as a "starter" on which is grafted a scion, or portion of yearling wood, which produces the shoot on which the desired variety may be either budded or grafted.

Double-worked Northern Spy root grafts are the stocks recommended, and they are mostly favoured by the fruit-growers in this State.

Plate 16 shows method of making this stock. Fig. 1 (A) is a piece of Northern Spy root 2½ inches long, cut with grafting knife and tongued (*a*). Fig. 1 (B) is a portion of yearling wood of the same variety 4 inches long cut and tongued (*b*). The root and scion are then placed together and the tongues put into each other to make a firm graft, and tied with a piece of soft string. Fig. 2 shows the grafting operation completed. The root graft is planted during early spring, and the bud, Fig. 2 (*a*), is allowed to project above the soil level (*b*). The sap commences to move in the starter (*e*) (*d*), that is, the piece of root on which the scion is grafted. Fibrous roots are thrown out, and a cambium connexion is soon formed with the scion (*a*) (*d*). Fibrous roots are also thrown out at the nodes (*c*) to (*d*), and from these the tree's future root system is mainly formed.

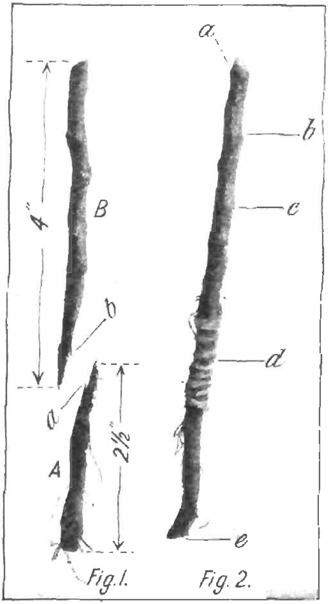

Plate 16.—Root Grafts.

This characteristic of the Northern Spy scion to establish a root system for itself independent altogether of the root-stock on which it is grafted, often gives rise to the erroneous idea of a diseased condition, being mistaken for crown gall or hairy root.

Plate 17, Fig. 1, shows development of the root graft during the first growing period after it was planted, the original graft being (*d*) to

(*b*), and (*h*) the surface level. The starter (*d*) to (*a*) made a weak growth on account of the scion (*a*) to (*b*) having sent out strong roots from the nodes between (*f*) and (*a*), while a strong shoot was sent up from (*b*) which was originally the terminal bud. This is an ideal

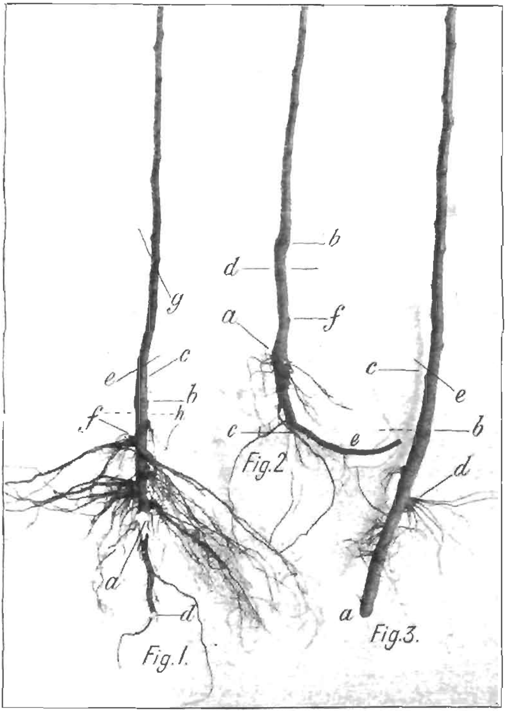

Plate 17.—Stocks.

stock in which a bud of the selected variety may be inserted (*c*) during February and the growth above it removed at (*e*) in September following. Should the bud miss, the stock may be cut (*g*) and top-grafted about 9 inches from the ground, when the sap rises, in the early spring.

Fig. 2 is a stock worked similarly to Fig. 1, the starter (*a*) to (*c*) being Northern Spy, but the scion (*a*) to (*b*) Winter Majetin, and when in the nursery row (*d*) represents the ground level. The starter made a stronger growth than in Fig. 1, but as almost invariably happens, in the case of the Winter Majetin, no roots were thrown out from (*f*) or the other nodes on the scion. This is also the case when the Majetin is worked on its own starter.

It will be observed that when a stock has to depend solely upon the starter to produce the root system of the tree, such root system is less perfect than when roots are given out by the scion also. The development of the strong root (*e*) indicates the influence of the scion upon the starter in this respect. The Majetin on its own starter usually produces a similar result.

STOCKS PRODUCED FROM LAYERS.

Plate 17, Fig. 3, is a stock cut (*a*) from the parent Northern Spy layer. To produce these stocks a Northern Spy tree is planted, and when a few years old a trench, about 8 inches deep, is dug in line with it, and the tree is bent down into the trench, and covered in with the earth. Trenches about 10 inches deep and running parallel to the layer, on both sides, about 15 inches away from it, are dug to insure perfect drainage.

During the first year after this treatment of the layer, young shoots are thrown up from the nodes. These shoots give out roots at the node (*d*) as well as from the others beneath the surface level (*b*).

As a rule these stocks are removed from the layer during early spring and planted out in rows, to the same depth (*b*) as when on the layer, and cut (*c*) to allow bud (*c*) to produce the shoot on which the desired variety may be either budded or grafted as explained in connexion with Fig. 1.

During the year following the removal of the first stocks from the layer, the young shoots are produced at the points at which the first stocks were cut off. This process, continued during succeeding years, causes the development of extensive stools from which great numbers of stocks are obtained.

BUDDING.

In order to secure a high percentage of successfully budded stocks it is desirable that the budding operation in each case should be carefully executed. The conditions governing the sap flow in the stocks during the months of January and February are, as a rule, more conducive to successful budding than those existing at any other time.

The sketches in Plate 18 depict method of budding. Fig. 1 (*a*) is a portion of yearling wood, of the variety selected for propagation, and from which the buds are secured. Neither the buds near the base side, nor yet near the terminal, are chosen. The leaf is first cut off as indicated (*g*). Then the budding knife is drawn from (*e*) to (*f*), and the bud, with a thin strip of wood about ¾ inch in length, to which it is attached, care-

fully removed. Fig. 1 (*b*) is side view, (*c*) front, and (*d*) the back of the bud.

To insert the bud in the stock, Fig. 2, the budding knife is drawn upward to make the vertical incision (*a*) about 1 inch in length, and the transverse incision (*b*) completes a (T). When this has been done, the bark may be lifted, with the budding knife, as shown in the diagram, and the bud carefully inserted. Fig. 3 shows the bud in position and the bark closed in around it. Fig. 4 illustrates method of tying the budded part. A piece of prepared raffia is used for this purpose. The

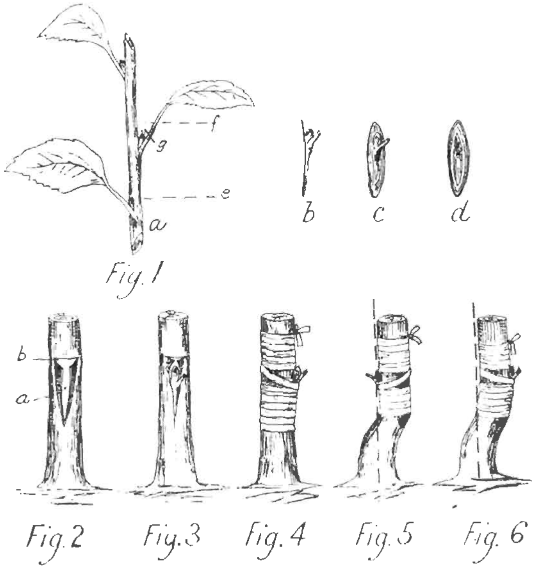

Plate 18.—Budding.

raffia should be neatly and firmly applied with a view to excluding the air from the wound until the bud has taken.

As a rule stocks produced from root grafts are fairly straight, and in such cases it is immaterial on what side of the stock the bud is inserted. But when, as in the case of the stock represented by Fig. 5, the growth from the terminal bud on the scion of the root graft strikes off at an angle, producing a crooked stem, it is advisable to place the bud on the inside of the bend, as shown, so that it may grow in the direction

of the dotted vertical line, and thus produce a straight tree. If the bud is inserted on the outside like Fig. 6, the tendency is to exaggerate the *evil and render the tree less amenable to pruning and general management.*

When it is observed that the bud has taken, the growth above it may be removed in early spring, as explained in connexion with Plate 17, Fig. 1 ( ).

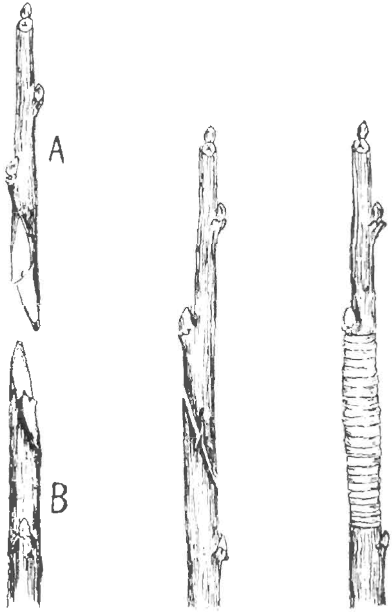

Plate 19.—Grafting.

Grafting.

Should the bud miss, and if it is desired to utilize the stock during the ensuing year, it may be top-grafted. Plate 19 illustrates the whip tongue method of grafting, which is the easiest and most successful when working on small wood. Fig. 1 (A) is a scion and (B) the stock. An upward cut is made, with the grafting knife, in the stock, about 9 inches above the ground, and then it is tongued as shown.

The starting of the branch system of the tree, on the three-bud or equilateral triangle principle, is advocated. Consequently, a scion or portion of yearling wood and containing three buds like (A) is taken from the variety selected for propagation. A downward cut, at the same angle to the vertical as that in the stock, is made in the scion. Then it also is tongued so that it may fit correctly on the stock when placed in position. Fig. 2 shows the relative positions taken up by the scion and stock. When they are drawn firmly together and bound with a piece of waxed cloth about 9 inches long by 1 inch wide, like Fig. 3, the callus which causes the union between the scion and stock is soon formed.

The growths, from which the scions are to be taken, should be collected during winter when pruning, and heeled in until required for use. The wood, when so treated, usually gives a much higher percentage of successful grafts than when taken fresh from the tree. Yearling upright growths of medium strength should be selected. When viewed from the vertical any three consecutive buds on a shoot of this kind usually forms an equilateral triangle, whereas the buds on horizontal and pendulous growths mostly lean to one side of the shoot, in consequence of the leaves, at the bases of which they are produced inclining upwards.

In propagating trees, whether by grafting or budding, it is important to choose scions from trees that have proved to be of good bearing habit and producing typical fruit of the variety selected.

It is only in this way that hereditary influence is conserved, and no other reason can be assigned in many cases for the variation in fruit production of different trees except the want of bud selection.

Single-worked Stocks.

A single-worked root-grafted stock consists of a portion of root of the Northern Spy or other blight-resistant variety, on to which is grafted direct the one chosen for propagation. In most cases, our cultivated varieties throw out roots from the nodes, and at the callus on the scion, when single working is adopted.

A tree worked in this manner is practically on its own roots, as the starter is invariably subdued. Many such trees, however, are found with their roots infested with woolly blight, when this pest is present in the orchard, and the practice is not to be recommended unless the variety itself is blight-proof.

The Young Trees.

Plate 20 is a photograph of three typical yearling trees taken from the nursery row. Figs. 1 and 3 are Jonathan, Fig. 2 is Granny Smith; (*a*) shows the points at which the stocks were budded, and, before the trees were lifted, (*b*) represents the ground line. Yearling whip growths invariably make the better shaped trees. But nurserymen frequently top the young growths (*c*) about 18 inches from the ground, during December and January, in order to make a head.

This operation, like summer pruning, has a stunting effect on the trees, and it should not be practised, particularly if they are making a

weak growth. *Fig. 1* was the weakest tree at the time the tops of Figs. 2 and 3 were removed, but on account of not having been interfered with, it became the strongest at the end of the period of growth.

When the tops are removed as explained, the shoot sent up from the terminal buds (*c*) (Figs. 1 and 2) on the young softwood usually runs to the vertical, forming an objectionable centre, which has to be removed, when planted out, in order to start the frame work of the tree on proper lines. As a rule, when trees are treated in this manner in the nursery, to prematurely form heads, they are usually cut too high. To remedy this defect, when they are planted out in the orchard the whole of this head should be removed by cutting at (*d*), when a natural branch system may be established from the three buds, on the stronger wood, immediately below that point.

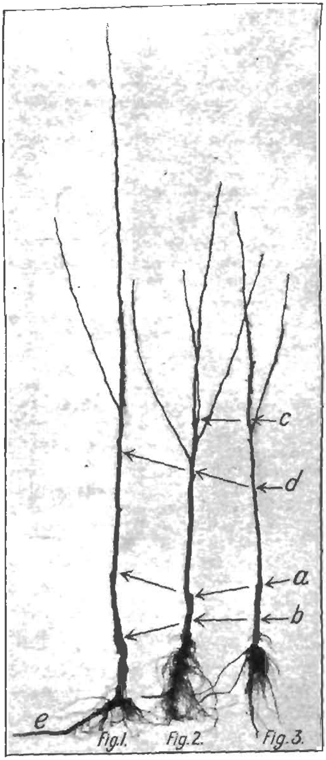

Plate 20.—Typical Young Trees.

When trees are being planted out in the orchard, their roots are usually cut back to about 6 inches. But as an experiment, the roots of these trees were almost completely removed, as shown in Plate 21. The strong root or foot in Plate 20, Fig. 1 (*e*) was produced to the detriment of the remainder of the root system. Instead of retaining about 1 inch of this root, as shown in Plate 21, Fig. 1 (*a*), it should have been completely removed by cutting at the base.

In the case of Figs. 2 and 3, there were no strong roots, but the [illegible] with. The trees were then planted out

to the same depth at which they grew in the nursery, and were lifted again after the vegetative period and photographed. The growth made by the roots and branches is shown in Plate 22. It will be observed that the portion of strong root retained again developed into a foot (Fig. 1 (*a*)) at the expense of the other roots, while Figs. 2 and 3 made strong, evenly balanced, root systems.

Regulating the Branch System.

It frequently happens that when the young whip-growths, Jonathan particularly, Plate 22, Fig. 1, are cut for the first time a stronger and more vertical growth is sent out from the uppermost bud (*b*) than from the other two buds below it. When this growth reached the point (*c*) the terminal bud was pinched out. This treatment had a stunting effect upon the leader, and a greater quantity of sap was thrown into the one immediately below it.

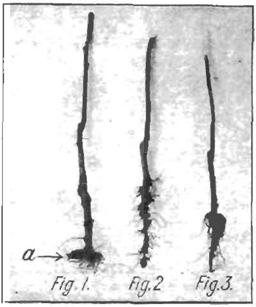

Plate 21.—Young Trees Cut to Desired Height.

This one then made a stronger growth in consequence, and when it reached the point (*d*) its terminal bud was removed. By that time the three small growths above (*f*) were produced, and their terminal buds (*i*) and (*j*) were also removed.

Through treating the two stronger leaders in this manner the lower one, which was at first thrown out at a rather open angle, gradually became stronger and assumed a more upright position (*g*) to (*h*) and became still more vertical from (*h*) to the terminal point.

Fig. 2, Granny Smith, is one of those which produces, naturally, leaders of more equal strength than the Jonathan and others. At the end of February, however, the two uppermost leaders, on the crown, were longer and stronger than the lower one. To remedy this defect

the terminal buds (a) and (b) were pinched out, in consequence of which, at the end of the period of growth, the leaders were all of equal strength and running at like angles to the vertical.

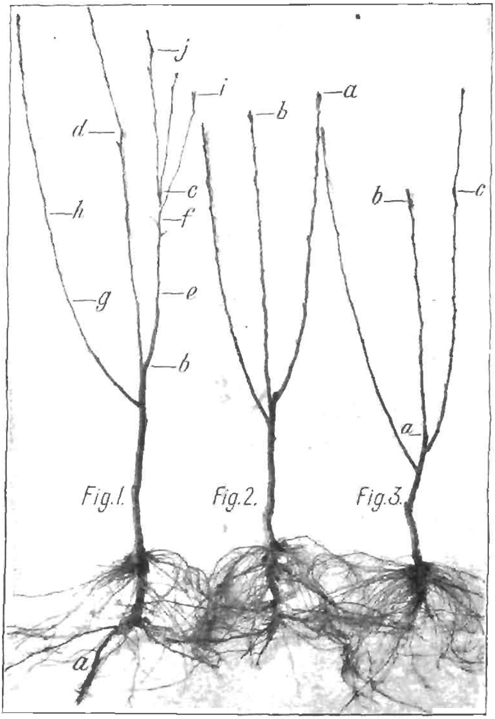

Plate 22.—Young Trees, First Year's Growth.

Fig. 3, Jonathan, is a weaker tree than Fig. 1. It, however, sent up a strong leader from (a), but when treated at (b) and (c) as described in connexion with Figs. 1 and 2, the foundation of a nicely-balanced branch system was the result.

Effect of Removing the Terminal Bud.

When the terminal bud on a young shoot is removed during the period of growth the wood ceases to extend in that direction, for some

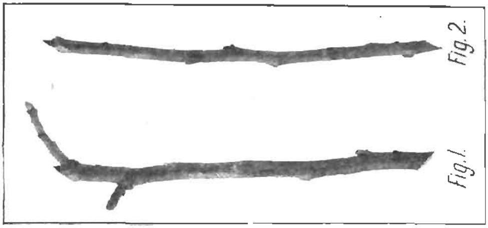

Plate 23.—Effect of Removing Terminal Bud.

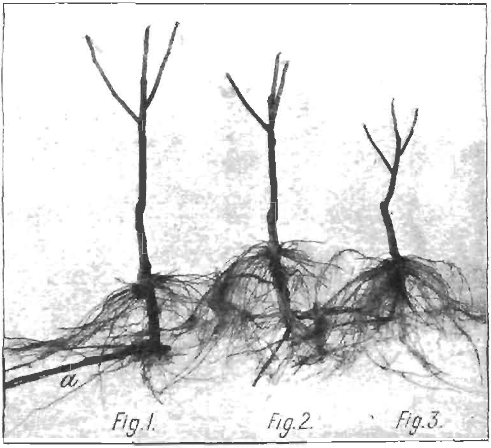

Plate 24.—Same Three Trees Pruned Second Year.

time at least. The leaves, which were produced below the position of the terminal bud, utilize their elaborated sap by strengthening the wood and developing the young leaf buds at their base. In fact, these are

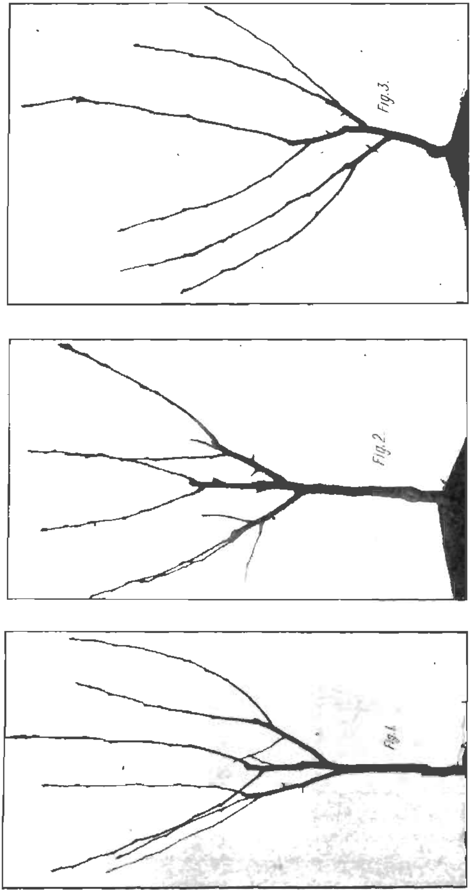

Plate 25.—Same Three Trees Showing Well-balanced Branch Systems.

often developed into blossom buds, before the young bud immediately below the position of the one removed commences to extend into wood growth. The nearest bud or two down the young shoot may perform similarly, according to the vigour in the tree and the time of disbudding.

Plate 23 illustrates this. Fig. 1 is enlarged section of wood taken from between (*e*) and (*f*) of the treated Jonathan leader in Plate 22, Fig. 1. This shows well-ripened wood and highly developed buds. Fig. 2 is taken from between (*g*) and (*h*) of the same tree. In this case the wood is not so strong, and the buds are weaker. This growth would have been still lighter had the other two leaders not been treated so as to assist it.

This matter will be further explained when summer pruning is being dealt with later on.

Pruning the Two-year-old Tree.

Plate 24 shows the same three trees in Plate 22, and illustrating method of cutting the two-year-old tree. Their leaders are cut back to side buds, about six inches from the crown, with the object of developing two main growths, in each case, on the yearling wood.

Fig. 1 is turned slightly around, to give a better view of the foot (*a*), the cause of the development of which has been previously explained. When photographed, the trees were again planted, with their roots unpruned.

Shapely Young Trees.

Plate 25 shows same trees one year older. The buds to which the cuts were made, as explained in connexion with Plate 24, responded, in every instance, by giving the two strong shoots desired. The shoots of Figs. 1 and 3, corresponding to those which produced the strong leaders during the previous year, were again inclined to offend similarly. But the swollen parts on these shoots indicate whence their terminal buds were removed and the equilibrium of the branch systems maintained.

Similar treatment of the offending leader on Fig. 2 kept it in order also.

By again cutting the young growths to buds corresponding with those to which they were pruned the previous year, sufficient leaders may be produced. Ten to twelve leaders are generally regarded sufficient for the root system to support on the class of soil usually favoured for apple growing, though where the grower practises heavy feeding of his trees it may be necessary to have more, providing provision is made for the free admission of light throughout the whole top.

(To be continued.)

POTATO CULTIVATION.

Cutting Seed and Rate of Seeding per Acre.

By J. T. Ramsay, Potato Expert.

The cutting of potatoes to be used for seed is essentially an economic question. In cases where only large tubers are available for planting the crop, it becomes necessary to subdivide these, in order that they may provide a greater number of sets, and so keep down the cost of seeding per acre.

In subdividing or cutting these, however, many growers go to extremes, and slice up the tubers into pieces which are too small. Where this is done, the crop is handicapped unduly at the outset.

Factors Governing Size of Sets.

The question may be asked—What is the best sized set? Before a direct answer can be given to this, several factors of environment have to be considered. The first of these is the vigor of the seed parcel. Seed of weak constitution will not stand as much cutting as seed which has been selected out of a healthy and prolific crop.

Undoubtedly one of the main reasons for varieties of potatoes so quickly degenerating to a level at which their cultivation ceases to be profitable, is the fact that practically no selection of seed is made, and the seed used is too severely mutilated by the cutting knife.

The second factor is the moisture content of the soil in which the seed has to be planted. Extremes of moisture and dryness are certain causes of "misses" when small cut sets are used. Therefore, unless the soil is in a nice condition of moisture, either whole or fair sized cut sets should be planted.

A third consideration is the fertility standard of the soil. If the fertility and physical condition be good, there is a lessened risk from the use of small cut sets.

Seed Cutting for Average Conditions.

The following comments and recommendations are based on the assumption that normally good potato land in a good state of tilth is to be planted, and that a parcel of potatoes made up of seed and ware sizes is available for the planting. When commencing to cut the seed it should be borne in mind that, within reasonable limits, the weight of the crop is proportionate to the weight of the seed used.

The fundamental reason for this is that the shoot or shoots produced from the seed set are in the first stages of growth entirely dependent on the nourishment they derive from the seed set. That being so, it is obvious that the larger sets can give a better start to the crop than can the small sets, simply because they contain a greater amount of the essential nourishment for the first growths.

Intense Propagation.

Under exceptionally favorable soil conditions, good crops have been grown from sprouts which have been removed from the tubers, but this

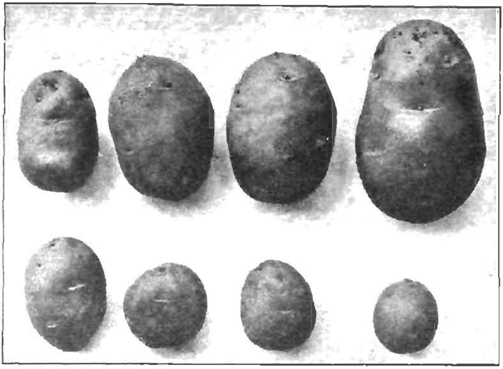

Fig. 1.—Average Variation in Size of Tubers in Ordinary Seed Parcel.

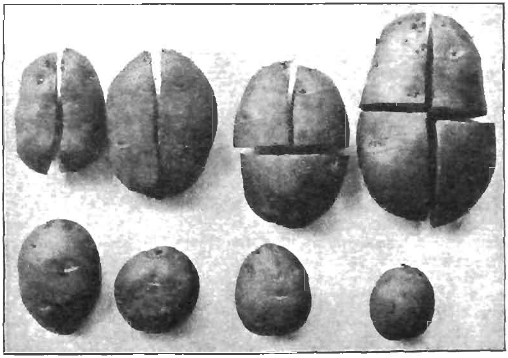

Fig. 2.—Method of Cutting Tubers Over Whole Seed Size.

degree of culture is not feasible in ordinary farm practice, and it is questionable if the prolificacy of a variety so treated would not be rapidly impaired by this method.

Method of Cutting and Size of Sets.

Fig. 1 illustrates eight seed tubers, the respective weights of which, commencing with the largest, are 9 ozs., 6 ozs., 5 ozs., 3 ozs., 2½ ozs., 1¾ oz., 1½ oz., 1¼ oz.

These are taken as being typical samples of variations in size found in the average seed parcel.

In cutting these for planting it is recommended that this be done as illustrated in Fig. 2.

It will be noted that no subdivision is made, and none is advised, of tubers under 3 ozs. in weight.

The subdivision shown results as follows:—

The 9 ozs. tuber ÷ 4 gives four sets averaging 2¼ ozs.
6 ozs. tuber ÷ 3 gives three sets averaging 2 ozs.
5 ozs. tuber ÷ 2 gives two sets averaging 2½ ozs.
3 ozs. tuber ÷ 2 gives two sets averaging 1½ ozs.

Cutting to smaller sizes than these is likely to prove false economy. The remaining tubers under 3 ozs. should be planted whole.

Under no circumstances should tubers of less than 1¼ oz. be used as seed for a field crop; *in fact, seed of less than 1½ oz. weight should not* be used if the soil and the seed are not in the best of condition.

In cutting large tubers, care should be taken—

First, that at least one good eye is left on each section.
Second, that the sections cut be as uniform in weight as possible and not less than 1½ oz. in weight.
Third, that portions showing weak buds are discarded.

Desprouting a Mistake.

A fairly common practice of some growers is to rub off all sprouts which may be growing from the tubers at the time of planting. This is a certain error.

By doing so, the seed tubers are set back some weeks in their growth, and are devitalized to the extent of the nourishment which they expended in producing the destroyed shoots.

It may be contended that the shoots are sometimes too long to permit the tubers being handled without breaking them.

If the tubers have long shoots growing from them, they are merely giving ocular demonstration that the grower's system of storage is very much at fault, and should urge him to the adoption of the system of storing his seed in proper seed potato boxes. These boxes have been described frequently in the columns of this journal and the press organs of the State.

Desprouting means devitalizing. That is beyond argument.

Fig. 3 illustrates tubers which have been allowed to exhaust themselves through over-sprouting. It is obvious that seed in the condition

shown could not be handled at planting time without breaking off the excessive growths produced by them. If these sprouts were removed, the shrivelled tubers could not again produce vigorous shoots, because their store of nourishment has been almost depleted.

This, of course, is an exaggerated case, but it serves to show how the vigour of seed potatoes is impaired by faulty storage conditions, conditions which force the sprouting of the tubers to such an extent that desprouting becomes a necessity. Storage of seed in seed potato boxes

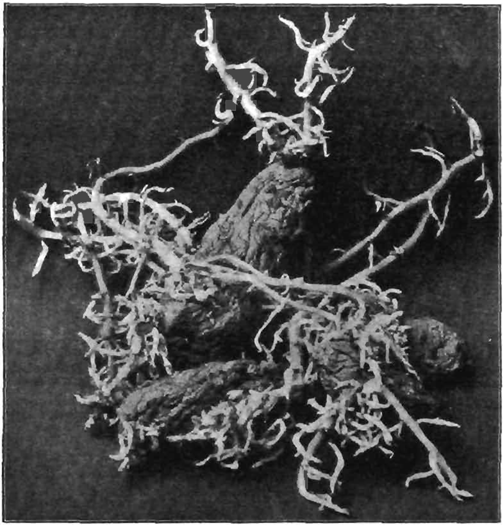

Fig. 3.—Potatoes with Shoots too far Advanced. Due to insufficiency of ventilation and light during storage period.

eliminates a difficulty of this kind, and improves the power of reproduction of the seed so treated.

Time to Cut.

It is advisable that seed, when cut, should be planted in the ground as soon as possible. It is courting failure to cut seed and store it for some days before planting. The results of hundreds of tests prove that seed planted on the same day as that on which it is cut gives the heavier yield.

Drying the Cut Seed.

The dusting of lime, ashes, or sulphur on the seed to dry the wound caused by cutting is not necessary, as the ruptured cells quickly dry on exposure to the air.

Sulphuring at this stage may have some advantage, on account of it being fungicidal in its action, but it cannot, in this capacity, be as effective as spraying the growing crop.

Viability of Various Portions of Tubers.

Provided that the tubers used for seeding are normally healthy, and are cut to pieces of equal weight—no section of the potato has superior vigour to another, *i.e.*, stem ends and terminals are of equal value, weight for weight. *The number of eyes on each set is of minor importance*—it is the size of the set which counts.

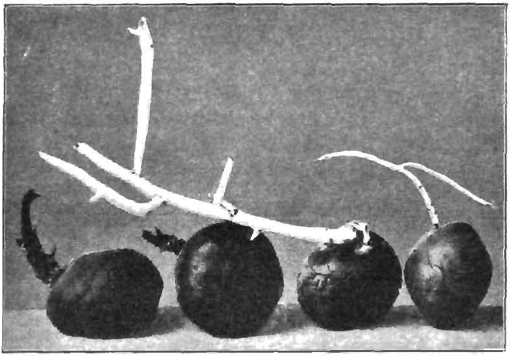

Fig. 4.—Evidence of the Advantage of Boxed Seed. Note perfect condition of the two specimens of boxed tubers (on left.)

Weight of Seed per Acre.

This, obviously, depends on the individual weight of the sets and the distance at which they are planted. For general practice, the spacing recommended by this Department is 27 inches between the rows and about 15 inches between the sets in the rows. If planting is done at these distances, and two ounces is the average weight of the sets, approximately 17 cwt. of seed per acre will be required for planting.

This is not a bit too much. The experience of specializing potato-growers goes to prove that it is sound business policy to use fairly heavy ratings of seed per acre, and to manure liberally.

Eugene Grubb, who acted as Special Commissioner to Europe in Potato Investigation for the United States of America Government, in summarizing his data obtained in the foremost potato districts of the world, states:—"The practice of successful growers indicates the best policy to be—

High fertility of soil.
Close planting.
Heavy rate of seeding per acre."

These elements of success in potato growing are within the control of the Victorian farmer, and until growers adopt improved methods of dealing with the crop, the average production per acre for the State (under three tons) will continue to be an unpleasant reflection.

It is of greater moment that the acres at present cultivated should be made to produce more, than it is that more acres should be brought under cultivation.

The former would mean a really progressive increase in the State's production—while the latter (with present-day farming standards) would only increase the magnitude of current mediocrity.

SULPHATE OF AMMONIA AS A FERTILIZER.

Special reference is given to the use of sulphate of ammonia as *a fertilizing agent for various crops, in a pamphlet recently issued* by the Department of Agriculture of Leeds University, England. The supplies of sodium nitrate not being available this year, farmers must rely on sulphate of ammonia for nitrogenous manure.

Experiments have been conducted in the East and West Ridings of Yorkshire on land varying in character. In the case of barley, the yield was increased from 3¾ bushels per acre to 7½ bushels by a moderate application of sulphate of ammonia. The effect on oats was more marked, the increase in one case being 9¼ bushels of grain and 4½ cwt. of straw per acre. For potatoes, sulphate of ammonia has been in great favour.

In the case of turnips, it was found, as a result of 44 trials over a period of eight years, that an application of ½ cwt. of ammonia sulphate, in addition to dung and superphosphate, increased the yield of swedes by 12 cwt., while a dressing of 130 lbs. gave an average increase, over four years, of 6¾ cwts. per acre in the case of meadow hay.

Extract *Journal Industrial and Engineering Chemistry*, June, 1916.

Very little of the simple manure ammonium sulphate is used in Victoria. A large percentage of the amount manufactured is exported.

On small holdings in mixed farm areas in the southern portion of the State, in the midland districts, ammonium sulphate used in conjunction with other manures is well worthy of trial.

Departmental experiments in the case of potatoes produced increased yields.

MEAT PRESERVATION ON THE FARM.

By J. C. Marshall, Stock Inspector.

In the warm months of the year there is often considerable waste of meat where animals have to be slaughtered for farm use. To minimize this loss prompts the writer to offer a few suggestions and methods to assist in the economical handling and preservation of meat on the farm.

Be it beef, veal, mutton, or pork that is required, at least one animal has to be slaughtered, and if it cannot be all used in the fresh state, there is considerable loss and waste with the remainder.

It may be said that from the time the knife is stuck into the animal, putrefaction begins, and the length of time the carcass will remain fresh depends, especially in the hot weather, mainly on its treatment *after slaughter*.

If possible, the animal should be killed on a cool clear day, and if in the warmer months, the cool of the evening is the best time. The animal should be well bled, and heavy beasts immediately after slaughter split down. Remove all internal flear and fat, including kidney fat. This facilitates the cooling, and allows the animal heat to escape. Generally speaking, the carcass should not be cut up until it has thoroughly cooled, and the following morning is the best time after slaughter overnight.

Clean utensils are absolutely necessary in dressing the carcass, and if it be required to wash away any blood or other stains, see that both water and cloth are perfectly clean, and that as little moisture as possible is left on the carcass. In fact, it should be wiped dry.

The carcass should be hung in a clean, well-ventilated room, or preferably in the open air, where the atmosphere is clear and pure. In localities where flies are troublesome, it may be necessary immediately after slaughter to place the meat, broken up into suitable sizes, in fly-proof safes or cover with proper netting or suitable material. In any case, the carcass should be suspended in a clean, well-ventilated place. A large safe with the sides and door covered with hessian material, or thin blanketing in lieu of the wire gauze, and kept continuously wet from a sprinkler attached to a hose, is a very good cooler for outside use in hot weather, and it is fly-proof.

As a general rule, it is best that meat should be set before being cut up, but in exceptionally hot weather it may with advantage be cut up and some of it used immediately after slaughter, and in very bad weather even before the animal heat has escaped. The amount required for immediate use—the portions ordinarily boiled (necks and shanks of mutton or veal)—should be cooked straight away. If sufficiently cooked, it will be found to be almost as good, palatable, and tender as if allowed to stand the longer period. In the case of the rougher pieces such as necks, knuckles, and shins, and pieces left as the result of boning (including bones), the soup derived therefrom will be better than if made from portions allowed to remain, even if it be only for a few hours.

The balance of the carcass must be freed from bone and superfluous fat. Absolute cleanliness with hands, utensils, tools, and benches is imperative in the process, and according to the quantity of meat required it may be preserved. If the amount is small, say, enough for two or three days' supply, the simplest method is the sterilization process. This method will be explained later in process No. 3. Meats which cannot be utilized at time of, or soon after, slaughter, must be preserved until time of consumption.

There are various methods in vogue for the preservation of meats, and they may be grouped as follows:—

1.—Curing by salting or pickling.
2.—Treatment with chemicals.
3.—Sterilization by heat.
4.—Preservation by drying.

Curing by pickling methods has been practised from the earliest times, and the chief ingredients employed are salt, sugar, saltpetre, and wood smoke. With the necessary skill and knowledge, meat can be preserved by this means, and flavours retained and developed which are, as a general rule, palatable and in some cases give an additional value thereto. The nutritive value of the meat is slightly, if at all, diminished by the use of the preservative agents employed. Salting has a dehydrating effect, and to some extent hardens the meat tissues without interfering with the mellowing process, and it also prevents the development of putrefactive organisms. Saltpetre in small quantities gives the necessary pink colour, without being injurious; its preservative action is small, but it has the effect, however, of lowering the temperature of the brine somewhat.

Sugar is not a necessity in the meat pickling process, and is only used in conjunction with salt for meat preservation. It breaks down any hardness that may be caused by the salt and saltpetre, and develops in the meat a pleasant flavour. To pickled pork and ham it imparts a flavour appreciated by many.

Wood smoke has a preservative action on meat, and meat products, by its dehydrating and drying effect, also by the action of its volatile acids permeating to some extent the meat subjected to its influence. In some wood smokes, creosote, carbolic, pyroligneous and other preservative acids impart to the meat special flavours as well as acting as preservative agents. The maximum of smoke with the minimum of heat is the best mode of application. A large barrel, or even the large chimney of the farm kitchen, does in the absence of a smoke-house for the purpose.

1.—Salting or Pickling.

The most common method, and if properly conducted the most successful for farm use, is that known as salting or pickling (wet process).

Make a brine in a wooden vat or tub, after seeing that it is perfectly clean, in the following manner. Mix sufficient salt with the required amount of water until it will float an egg or potato. Boil the whole, and when cold add ½ lb. saltpetre to every 10 gallons of brine. The meat to be cured in this way should be, in the hot weather, cut down to rather

small joints. In the cooler weather the usual joint sizes can be adhered to. Pack the meat in layers after rubbing each piece with dry salt, cover with a board, and weight down under the brine. Sprinkle with a little fresh salt every day when changing the position of the meat. The brine tub should be located in a dark, cool place. A cellar is about the best situation, and this should be well ventilated, as if muggy and close, brine fermentation is set up. If any sign of fermentation appears in the brine, indicated by frothing and bubbling, remove all meat and wash in water which has been previously boiled, and to which a small quantity of salt has been added. To each gallon of wash add ¼ oz. of washing soda. This will check the action of fermentation bacilli. Boil the brine, adding more salt during the process of boiling, so as to bring it to the original strength. Dust a little salt on each piece of meat before replacing it in the cold brine. Pickle well made and kept up to its proper strength should keep for years. It is best to leave a little meat or a few bones in the pickle to carry it through the winter months, even when it is not required to corn much meat. This keeps the pickle right by acting as a feeder. Meat cured in this way is fit for use in from 24 hours. If it be necessary to leave meat in the brine for long periods, it should be well soaked in cold water before cooking, to remove surplus salt. On farms where pickling is the regular practice, and the quantity used merits it, a small brine pump would be an acquisition. This is a simple contrivance, easily worked, and by its use it would make doubly sure quick pickling in hot weather. The pump forces the brine throughout the meat tissues, and the centre of the meat is salted before it has time to go off. Brine pumps can be purchased for about 25s. upwards. Old matured sweet brine is the best for pumping purposes, and the needle of the pump inserted every 2 or 3 inches and a small amount of pickle injected. This is preferable to large spaces between the needle insertions, and a larger quantity of brine injected. Care must be taken in using the brine pump that the needle is always full of brine before inserting the needle into the meat, otherwise it will be air blown, and putrefaction rapidly result.

Dry Pickling.—Free the meat to be treated by this process from all bone, and cut into suitable sizes, much smaller in hot weather than in cold weather. The meat should be rubbed with salt and dusted with a little finely-ground saltpetre. The proportion is 50 parts salt to 1 saltpetre. There will be a certain amount of natural brine formed, and this may be poured over the meat. It is imperative that the best quality of salt shall be used, and a mixture of equal parts of fine and coarse salts will be found the most efficacious. Pack the meat in barrels or a clean wooden receptacle in a cool, well-ventilated place as recommended in the case of wet pickling. It is claimed by many that the addition of a little sugar improves the flavour, but as sugar is likely to induce fermentation, it could only be used during the cooler months of the year. In the hotter portions of the State during the summer months, instead of packing the dry-salted meat away in cellars, hanging the meat in a wet bag in a good draught has proved successful. Let water drop continuously on the bag from a cistern arranged above the bags. A wet hessian safe, sometimes known as a "Coolgardie" safe, is a good place to store dry-salted meat in the very bad weather.

Smoking.—If required, some of the salted meat may be subjected to further treatment by smoking. In the case of beef, certain parts, such as boned brisket, can be tied with stout string into rolls and smoked. Corned legs of mutton should be dusted with pea meal and smoked into mutton hams. Smoked corned ox tongues keep well, and the flavour is preferred by many. After salting, the meat to be smoked should be washed free of salt, hung up to dry, then placed in the smoke-house and subjected to a cool smoke for from two to three days. A smoke can be made by lighting a small wood fire in the smoke-house and covering it lightly with sawdust. Place most of the sawdust in a circle round the fire. See that the fire does not again spring into flame, but that the sawdust goes on smouldering.

2.—Treatment with Chemicals.

The practice of preserving meat with chemical agents is a recent innovation in the curing of meat, and came into use within the last thirty years. For preserving meat for sale, it is now prohibited, as far as this State is concerned, by the introduction of the Pure Foods Act. It is generally conceded the preservation of meat by means of chemicals, though effective, is more or less dangerous, and should not be practised where other processes can be substituted. Meats preserved by the aid of chemicals when consumed are harmful to the human subject. In the very hot weather, the addition of a little boric acid to the pickle in salting meat may be advantageous. Chemical preservation of meat for farm use is not recommended.

3.—Sterilization by Heat.

Of the methods suggested sterilization, although perhaps requiring a little extra care, is the least objectionable, and when properly conducted, safest for meat preservation in the fresh state. The raw meat must be free from disease and obtained under sanitary conditions, and handled cleanly until sterilization is affected, and this must be done before any fermentation or decay can possibly take place.

Method.—(*a*) Reduce the size of the meat to be treated to not larger than about 6-in. cubes, and it should be as uniform in size as possible. Place meat in a boiler that has a tight-fitting lid, add a little salt, and sufficient boiling water to cover. Boil from ½ to ¾ hour. Then add about a pint of rendered fresh mutton fat. Replace lid and again boil for a few minutes. Remove boiler to a cool place without disturbing lid till meat is required for use. Every time meat is taken out of boiler for complete cooking, the boiler should be replaced on fire and boiled up for about 15 minutes. Again place boiler in cool place. Rapid cooling is a feature in the success of this process.

In the absence of proper boilers a clean petrol or kerosene tin can be substituted. The meat should be boiled in this receptacle for about ½ to ¾ hour, and a good coating of rendered fresh mutton fat poured on while hot. Remove to cool place, where the fat will crust above the meat. Every time fatty crust is broken again boil up for 15 minutes.

Some of the better quality cuts may be roasted in the ordinary way and while still hot dropped into the petrol tin containing the fresh

rendered mutton fat. See that meat is completely covered in fat, and remove to the coolest spot available. Quick cooling contributes largely to the success of this process.

(*b*) Another process is to cut pieces of meat into suitable sizes free from fat and parboil them. They are then dipped into liquid gelatine at a temperature of about 140 deg. Fahr., and thick enough to leave a good coat on the meat. The pieces treated should be removed to a cool place, and when thoroughly dry packed away with sawdust in suitable receptacles.

(*c*) It is possible to preserve freshly-killed meat with the aid of powdered charcoal by cutting the meat into suitable sizes and packing away in a suitable wooden receptacle, such as a clean packing case. Starting with 2 inches of powdered charcoal on the bottom, and alternating the layers of meat and charcoal, and finally covering the top layer with the powder. Stow away in a cool place. The preservative action of charcoal is well known, and is due to its absorptive properties and its affinity for oxygen. It prevents the entrance of oxygen to the meat. There are also preservative agents such as creosol in the charcoal. The meat can be washed free from powder and cooked in the ordinary way as required.

4.—Preservation by Drying.

The flesh of animals used for human consumption has a high water content averaging, according to condition of animal, from 50 per cent. to 75 per cent., and by removing the bulk of the moisture from the meat the keeping property is enhanced, so much so that if it be completely dried, it will keep for very long periods. It has been shown that salt preserves meat by its drying effect. This dehydrating effect can also be obtained by the application of heat. Under suitable conditions the drying can be done in the open air by natural heat. In most cases it is unnecessary to evaporate the whole of the water present. The quantity extracted will depend on the length of time it is required to keep the meat. Dried meat is unattractive in appearance, but little of its nutrition is sacrificed. Boiling is the best mode of cooking. Beef and veal are the best meats to be treated by this method.

(*a*) Free the meat from bone, sinew, blood-vessels, and fat, cut into thin slices, and hang in the dry hot air and sunlight till hard and dry. Then pack away till required.

(*b*) Cut meat into thin slices and free from fat, sinew, and veins, then rub thoroughly with a little of the following mixture. Salt, 4 lbs.; saltpetre, 5 ozs.; black pepper, 5 ozs. Hang in hot dry air and sunlight till dry. Pack away with sawdust in cool place.

(*c*) Free from fat, sinews, and veins, and put meat through a mincer and dry in hot air or over a mild fire on an iron tray. Temperature not to exceed 140° Fahr. The meat will dry out rapidly, when it can be powdered and stored in airtight tins or bottles for future use. For making soup and gravies it has proved suitable, and is known as Dry Powdered Meat.

As previously mentioned, meat to be successfully preserved must be treated, especially in the hot weather, within a few hours after slaughter. Success is not to be looked for if flesh is allowed to hang about for any length of time before treatment. If, for instance, on a small farm, in the hot weather, a sheep is slaughtered and the requirement is about one-third for a day, unless a cool change sets in the portion unused on day of slaughter will probably be wasted unless it is preserved by one of the methods suggested.

BLUE MOULD IN TOBACCO PLANTS.

The following treatments of the soil to prevent root rot and other fungoid diseases, as experienced in America, are well worthy of a trial in Victoria for blue mould, and particularly so for late beds, when the earlier sowings have failed. Tobacco plants can be raised from seed sown as late as the first week in November, in time for late December planting, provided they are grown in cold frames, *i.e.*, the beds enclosed with boards 12 inches high all round, and covered with cheese cloth or coarse hessian. This system maintains a more uniform temperature, conserves moisture, and obviates the risk of infection from outside sources.

The plants should be exposed for a couple of days to the sun before transplanting to harden them.

—TEMPLE A. J. SMITH, Tobacco Expert.

TREATMENT OF TOBACCO PLANT BEDS.

(By A. D. Selby, True Houser, and J. G. Humbert, of The Ohio Agricultural Experiment Station).

While the root-rot fungus was first examined from certain Clermont County plant beds in 1899, it has not often seemed a serious disease in the Miami Valley District. It was certainly serious in the plant beds during the season of 1915; this root-rot continuing to cause serious losses after the plants were set in the field. In certain soils of the water-holding types, like the soils of the South-Western Test Farm, Germantown, the tobacco crop was little, if any, more than one-third the normal average. This agrees with the experience of others in wet seasons. The work heretofore done upon this disease by Gilbert* and others, has shown the many-sided nature of the problem.

Experiments show that the root-rot fungus may be thoroughly killed out of old plant beds by either of two tried methods of disinfection applied to the soil, viz.:—(1) By steaming the soil, preferably by use of the inverted pan method. (2) by means of formaldehyde (or formalin) drench upon the prepared soil of the bed.

It is to be noted—

(*a*) that no one will care to extend his losses from root-rot into another season, if avoidable;

(*b*) That the root-rot fungus will survive in the soil, as in old plant beds, where it prevailed in 1915. It may survive in fields as well.

Having the whole situation before us, it seems wise to kill the root-rot fungus out of plant-bed soil through sterilization by steam or formaldehyde. Either of these may be applied before winter begins, if that is so preferred. It is clear that healthy plants are essential to a successful tobacco crop. First attention to growing sound plants is accordingly advised.

* Gilbert, W. W., Bul. Bureau of Plant Industry, U.S. Department of Agriculture, 158 : 1909.

FALL TREATMENT OF SOILS FOR PLANT BEDS PRACTICABLE.

In spring the soil is liable to be full of water, and better conditions for bed spading and preparation may occur in late fall, besides avoiding the delay in seeding which is often objectionable in spring treatment. When fall treatment is practised it will not be necessary to re-spade the bed in spring, preparatory to seeding; only the surface need be worked. The object of such treatment is to destroy the forms of the root-rot fungus or other species, such as bed-rot &c., which otherwise live over in the beds where the disease occurred in 1915. Because the "Thielavia" is found upon numerous other host plants it is not clear that new bed locations will avoid the necessity for treating the soil. For the present it is not expected to discuss and list the plants attacked; rather to prepare a method whereby healthy tobacco plants may be produced for setting in the field.

PREPARATION OF SOIL TO BE TREATED.

Previous to treatment by any method, the soil should be prepared much after the manner of preparation for seed-sowing. If manure is to be applied to the bed area, make such application in advance. When chemical fertilizers are to be used, their application need not be made until spring, just before sowing seed. The soil to be treated is taken in good workable condition, certainly not over-wet, spaded to the necessary depth, and thus handled in a preparatory manner. Very dry soils have not been found satisfactory. There seems to be no need to rake over the spaded soil beyond that necessary to fine it enough to facilitate penetration of the drench or steam.

STEAM STERILIZATION BY INVERTED PAN.

The apparatus necessary for steaming consists of an inverted pan made of galvanized iron, having nipple attached for steam hose, which is to connect the pan with a boiler of 8 to 12 H.P. capacity; the ordinary traction engine has proved serviceable in furnishing steam. A pan which will fit the usual plant bed, namely, 5 ft. 6 in. by 8 ft. 6 in. by 7 in. deep, is advised. This is to be made of heavy galvanized sheet iron, preferably rust-proof, of 18, 20, or 22 gauge. These metal sheets, ranging in size from 2 to 3 feet wide by 8 to 10 feet long are seamed, riveted, and braced by strap and angle iron for stiffening the pan. Four or five sheets will be necessary.

After the soil is prepared the pan is inverted over a part of the bed, with edges pressed down into the soil so as to form a steam-tight air chamber. Steam is then turned on from the generating boiler under 50 lbs. to 80 lbs. boiler pressure. At this pressure it will sometimes be found necessary to weight down the pan to keep it from lifting. Each area requires to be steamed approximately one hour. After removing the pan to adjacent part of bed, the soil is to be tested with a thermometer, and should register 180 to 210 deg. F. at a depth of 3 to 6 inches. If this temperature has not been attained, increase the steaming period by 10 to 15 minutes.

BED DRENCHING WITH FORMALDEHYDE.

It is more convenient to drench the soil of the plant beds with a solution of formaldehyde (formalin), as only a sprinkling pot with hose will be required in addition to the chemical. However, previous experience fails to show equal effectiveness in complete killing out of the plant-bed fungi.

The strength of solution to be most successful probably should be stronger than that heretofore suggested, and the amount of solution applied may prove to be less with the stronger formula. The proportion of one gallon of formaldehyde to 50 gallons of water, and the application of one-half gallon per square foot of surface, has been suggested by Johnson in treatment of plant beds for a different fungus "Pythium." This may prove to be successful for the root-rot. For the present a strength of one gallon of formaldehyde to 100 gallons of water is promising. Of this weaker solution the total application should amount to three-fourths of a gallon to one gallon per square foot covered. In the application, the solution should be applied as evenly as possible to avoid waste, and at two or more applications. In all cases, effectiveness is gained by covering the plant-beds with canvas to prevent escape of fumes. Before applying the solution, the beds should be fairly moist and friable. If locally too dry an unevenness will show in the results of treatment. Even penetration of all the soil is the aim.

ADVANTAGES AND DISADVANTAGES OF STEAMING AND DRENCHING.

The relative advantages of steaming compared with formalin drenching are largely in the more certain effectiveness and thoroughness of the steaming, together with the killing out of weed seeds in the plant-beds, thus saving subsequent cost of weeding. Perhaps yet another advantage of the steaming is that it brings tobacco growers to realize that a real problem is to be met, not an invention of the mind, and that foresight in preparation and treatment are required. Further, it will probably be found that the heavy soils of the uplands will not be easily penetrated by the formalin drench. On the other hand, the gravelly soils of the valley districts will be likely to respond quite satisfactorily to the drenching method.

This circular has been prepared to give timely advice to those expecting to grow tobacco crops in 1916. It does not cover the problems relating to the possible presence of the root-rot fungus in the soil where the crop is to be grown, but this problem may be left for the present, since it is impossible to grow a good crop without growing a healthy supply of plants. It is hoped, upon further investigation, to supply additional information regarding the root-rot problem in tobacco fields. It is urged that growers group themselves together and co-operate in the treatment work. This co-operation may apply in the combined purchase of an inverted pan for steaming the beds of a group of growers, or if the formalin drench method is used, in the purchase of formaldehyde in carboy lots.

Do not sow seeds too deeply, as many crops fail on this account.

Do not apply rank manure to soil in which tap-rooted vegetables, such as beet-roots or parsnips, are to be grown.

It was a far-seeing man who wrote long ago:—"Some day thou shalt know by experience how sad a path it is to be dependent on others."

It is on rich soils that artificial fertilizers, judiciously used in conjunction and supplementing farmyard manures, produce the most profitable results.

Official figures state that there are in the United States 21,262,000 milch cows, 37,067,000 beef cattle, 49,956,000 sheep, 64,618,000 pigs, and 21,195,000 horses.

Those farmers not already possessing power would do well to now install a suitable oil engine. These work cheaply, and save both time and hand and horse labour.

Do not forget that crops of peas, beans, onions, carrots, and many others are greatly benefited by light dressing of soot, fowl manure, or nitrate of soda during showery weather.

Barley is selling in Scotland at a figure that is not within the recollection of the proverbial oldest inhabitant. As much as 6s. 5d., 6s. 6d., and 6s. 7d. per bushel is being paid for the best samples for distilling purposes.

A good preparation of the soil is one of the most important elements of success in the introduction of crops. The finer the condition of the soil, the better is the crop able to extract its nourishment.

It has been calculated that the stoppage of fodder imports into Germany will involve a decrease in the supply of meat by one-half. The mailed fist of the British Navy is hitting the German Empire!

No food is so cheap nor so effective in the feeding of deep-milking cattle as good pasture. It is only when the pasture is of poor feeding quality, is dried up, or is of too rank a growth that supplementary fodder is required.

INSECT PESTS OF THE FRUIT, FLOWER, AND VEGETABLE GARDEN.

AND HOW TO TREAT THEM.

By C. French, Jnr., Government Entomologist.

(*Continued from page 498.*)

The Metallic Tomato Fly.

This pest is a very handsome fly, belonging to the real "fruit flies." It is of a metallic, bluish-green colour, and less than half the size of the common house fly. The eyes are very large and prominent, and the body somewhat short and plump for the size of the insect. The larvæ are about the size and shape of the common blowfly, and as many as eight have been found in one tomato. This insect, so far as can be ascertained, is an importation from New South Wales, and has spread to all parts of Australia. It has been stated that it will only attack fruits, &c., when they are either nearly ripe or have been bruised in some way. In Victoria, our experience is that it will tackle fruit, especially tomatoes, upon which no bruises of any kind can be detected, even with the aid of a good magnifying glass. It is giving no end of trouble where tomatoes are grown extensively, and many cases which were thought to have been attributable to the fruit fly have been traced to the depredations of this tiny insect. Spraying with quassia chips and benzole emulsion as a preventive has given good results. Smudge fires, as used against the Rutherglen bug, would, no doubt, keep these flies from tomatoes that are ripening. When tomatoes,

Fig. 20.—Metallic Tomato Fly (*Lonchæa splendida*).

&c., are found to be affected with the grub of this fly, no time should be lost, and all infected fruit should be gathered up and boiled.

Tiger Moths.

The dark-striped tiger moth and the light-striped tiger moth are two native moths, which, in the caterpillar state, are very destructive to all kinds of plants—dahlias, carnations, sweet peas, pelargoniums, &c., and all kinds of vegetables, especially beans, are destroyed by them. The caterpillars are hairy, and may frequently be seen in large numbers. As a rule, birds do not seem to be partial to these insects. The eggs are often deposited amongst weeds on neglected headlands. When hatched, the young feed ravenously. The cocoons are deposited near the tussocks, and are partly covered with grass. The larvæ feed mostly by night, and hide by day. As this pest threatens to become a serious one, prompt action must be at once taken to stamp it out. Excellent results can be obtained from the arsenate of lead spray. This spray mixture is cheap, and there is no difficulty in mixing it. The arsenate of lead is placed in the pump, the water added, the nozzle of the pump placed inside the pump, and the mixture of arsenate of lead and water forced through the nozzle for a few minutes till the mixture is complete. In motor pumps, the agitator in the pump mixes the material.

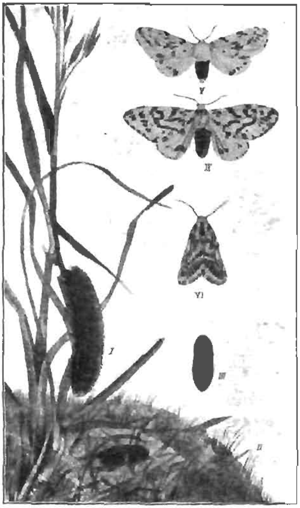

Fig. 21.—Dark-striped Tiger Moth
(*Diacrisia canescens*, Le G.).

Light-striped Tiger Moth
(*Ardices glatignyi*, Butler).

Thrips.

The minute insects known as thrips are among the most notoriously injurious pests to cereals and other plants—such as roses, dahlias, carnations, tomatoes, beans, onions—known. They are difficult to deal with, on account of their habit of crawling into the centre of the flowers of roses, fruit trees, raspberries, &c., and sucking the juices out of the petals. This causes them to turn a dirty-brown colour. In some

instances, they die before the fruit is formed. Thrips are minute insects, seldom exceeding a line in length. The eggs are extremely small, cylindrical, and round at one end. From them issue little larvæ quite as active as their parents. When the insects are fully grown, their wings are long, narrow, and lie flat on their back when at rest. They are surrounded with ciliae, or hairs, giving them the appearance of tassels. The species under notice is an introduction from Europe, and has long been known in England and elsewhere as one of the gardener's worst enemies. The life cycle of these insects is as follows:—Development of egg, 10 days; development of larva, 30 days; development of nymph, 7 days; total, 47 days. During the past few years these troublesome insects have been very severe on potato crops in many parts of the State, and Mr. G. Seymour, the former potato expert of the Department, estimated one season's loss at several thousand pounds. The thrips question is even now a very serious one, as so large a number of plants are subject to its attack, and no one knows where the trouble is going to end. It behoves all growers to look this trouble square in the face, and, if possible, to keep it within reasonable bounds. When the fruit trees are in bud is the time for an occasional spraying. Various remedies have been tried, the best of which is as follows:—Benzole emulsion. This is a patent preparation, which can be obtained from any seedsman in Melbourne. The cost per tin is only a few pence. One tinful (1 lb.), when diluted, makes 5 gallons of spray. If this is sprayed on the flowers it acts as a deterrent. Fruit-growers in the Beaconsfield District, on my suggestion, used this material, and they report good results. As a deterrent, spraying with tar-impregnated water, or a weak kerosene emulsion, is recommended. The following is the formula for coal-tar water.—Boil 1 lb. coal tar in 2 gallons of rain water, and while hot add from 50 to 100 gallons of water. Nicotine, lime sulphur, hellebore, and quassia sprays have also given good results. Pine Spray, a patent preparation, has also been used with success against these pests. I would suggest that, when an orchard is badly

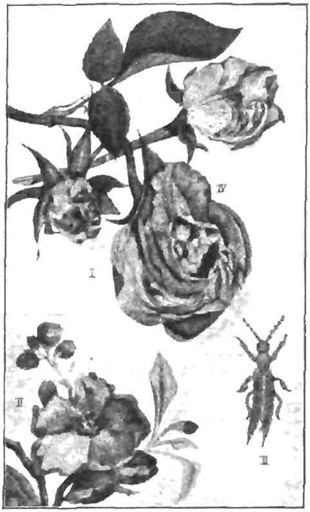

Fig. 22.—Common Thrips (*Thrips tabaci*, Lindemann).

attacked by thrips, smudge fires, as recommended against Rutherglen bugs and cherry green beetles, be tried.

Tomato Weevil.

This is a native insect, which has become a serious pest to persons growing tomatoes and other vegetables, and also garden plants. The

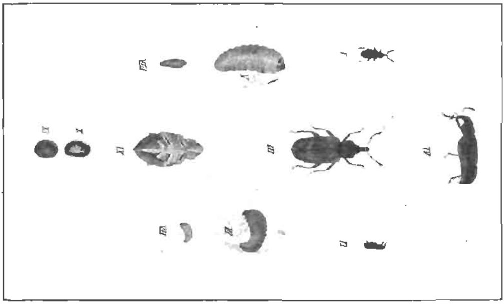

Fig. 23.—Tomato Weevil (*Desiantha nociva*, Lea).

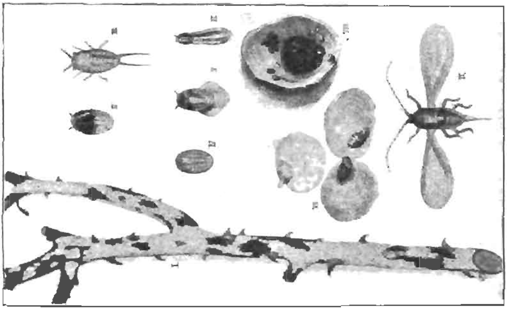

Fig. 24.—Rose and Raspberry Scale (*Diaspis rosæ*, Sandberg).

larva of this insect is greenish in colour, and measures about ¼ inch in length. It is usually found in the soil a few inches below the surface, where it conceals itself in the day time, and at night comes out to feed. It devours the whole plant very rapidly. One grower, residing near Essendon, informed me that he lost eighty fine tomato

plants in one night, and that on one evening alone he collected no less than 638 of these weevils. The perfect insect measures about $\frac{1}{4}$ inch in length, greyish or dark-brown in colour, with a somewhat V-shaped marking on the wing-cases. Many experiments have been carried out for the destruction of these insects and the arsenate of lead has given the best results. Another good plan, which has been tried with much success, is the placing of pieces of newspaper under the leaves of the plants at night, and for the grower to go out at intervals with a light: the beetles, startled by the light, immediately fall into the paper, and may then be destroyed.

Rose and Raspberry Scale.

White scale infests roses and other plants belonging to the same order. On some plants the scales are so thickly clustered that the stems look as if they had been whitewashed. The female insect is protected by a circular, hard covering. On removing it, hundreds of young scales will be noticed. These, shortly after being hatched, commence to suck the juices from the plants, which causes them to become sickly, and if not attended to will die. The following remedies will prove effectual:—Prepared red oil This should be used after pruning, or, better still, before pruning, as pieces of the prunings are often left on the ground, and the young scales will leave them and go back to the old plants. Kerosene or benzole emulsion could also be used. Scrubbing the stems of the rose plants with a scrubbing or other hard brush dipped in soapy water, to which is added a little kerosene, is effectual in ridding the plants of this scale.

The Gum Scale.

This is one of the commonest scales in South Australia. It is generally found on young eucalypts, but is often found on other tall trees also. Fortunately, it is rarely found on fruit trees; only one instance, as far as I know, of its having been found on apple trees, is recorded. The larvæ vary in colour from yellow to light red, and when hatched, crawl all over the twigs. The fully-grown female scale is enclosed in a rounded, cotton-like sac, being in colour from creamy white to yellow, sometimes dull red; these scales are attached to the twigs, and so closely are they packed together that, in some instances, it is impossible to see the stems or twigs to which they are attached. Sugar and mahogany gums in gardens and plantations near Melbourne are often attacked by these insects. Ladybirds, and the scale-destroying moths, help to keep this pest in check. In New Zealand, this scale was very bad in the plantations. A consignment of ladybird beetles was sent over and liberated, and in a very short time most of the scales were killed by these useful insects. As a means of keeping it in check, the red spraying oil, sprayed on the trees in summer, has given splendid results. Kerosene emulsion is also recommended.

The Vine Scale.

This is an introduced species, being common in England and elsewhere, and causing no end of damage to plants. It is probably the

largest of the hard-shelled scales, and it is spreading in Victoria, and is doing considerable damage, especially to young vines. There is no doubt that this scale is on the increase; but, as it is so large, it is easily seen, and steps can be at once taken for its eradication. If the scales are removed, hundreds of minute eggs are seen; when these hatch, the young at once commence to suck the juices from the plants, causing

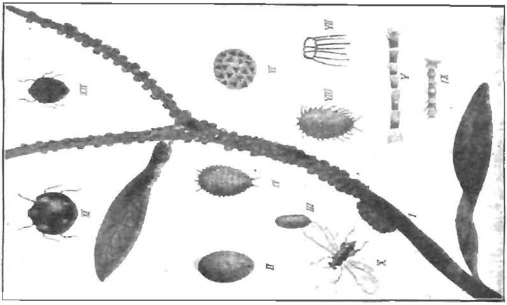

Fig. 25.—The Gum Scale (*Eriococcus coriaceus*, Maskell).

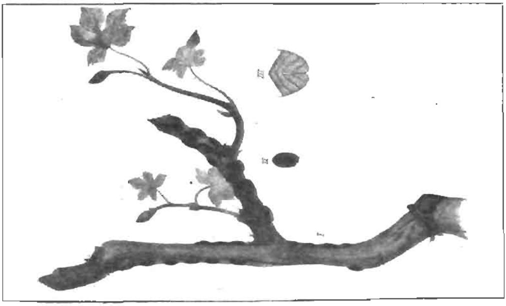

Fig. 26.—The Vine Scale (*Lecanium berberidis*, Sch.).

them to become a sickly colour, and often shrivel up. A good plan is to rub the adult scales off the affected plants with a scrubbing brush, the eggs will then fall to the ground and perish, or be carried away by ants and other insects. Scrape off all old, loose bark from vines, as these insects hide under it. Unfortunately, it has recently been found

on plums, apricots, and other trees, also on garden plants, principally fuchsias and pelargoniums. If the plants are sprayed with red oil or benzole emulsion the scales soon disappear.

The Rose Aphis.

This destructive insect is well known. The family of aphidæ contains many species or varieties. Nearly every plant has its own particular aphis. They are all minute, soft-bodied, and generally long-legged. The mouth is furnished with a curiously constructed beak for sucking the juices of the plants. The life-history of these insects is very complex. The winter eggs, or larvæ, lie dormant during the cold in crevices in the trunks, or hidden underground on the roots of the host plants. As the warm weather approaches, they crawl up the trunks, cluster round the leaf-buds, and, sticking their sharp beaks into the tissue, suck the sap. They give birth to larvæ, which grow rapidly, and in turn (through virgin females) bring forth fresh broods of live larvæ, which, in the course of several generations, develop two pairs of large, transparent wings. The aphides are usually of both sexes, though in some species the males are wanting. The last generation flies away in swarms. Before dying, the insects deposit eggs, which carry on the cycle of their life into the next summer. The following sprays have been tried with good results, viz.:—Tobacco-water. Quassia-water (soak 1 lb. quassia chips in 1 gallon of cold water overnight, and boil gently for four hours. Strain off the chips, and dissolve ½ lb. of soft soap in the solution. This will make 10 gallons of spray). Benzole emulsion, surpazol, Niqua's pine spray, and red oil (used after pruning is absolutely the best spray for these insects) are also recommended

The Apple-Root Borer.*

This weevil is a native insect which formerly infested wattles (acacias), but has now forsaken its natural food, and is one of the worst insect pests orchardists, vignerons, and others have to deal with, on account of the grubs or larvæ living deep in the soil and in the roots of apples, vines, &c. The perfect insect is usually of a light-grey colour, but is a variable species, sometimes the colour being a brownish-grey. The females are larger than the males. The insects crawl up the trees: the female depositing her eggs on the leaves, and closing the leaves over. Sometimes the eggs are deposited on grass and weeds, therefore it is absolutely necessary to keep orchards free from weeds, as they are always a barbor for all kinds of insects. The following remedies have been tried, and have given fairly good results, viz.:—Spraying with arsenate of lead, and trapping the beetles. Experiments for the destruction of root-borers are now being carried out, under the supervision of Mr. E. E. Pescott, at the School of Horticulture, Burnley, and when finished the results of our investigations will be published in the *Journal*

Conclusion.

The illustrations, and many notes on insects, are from the works of C. French, senior; W. W. Froggatt; and A. M. Lea.

* This insect is not illustrated.

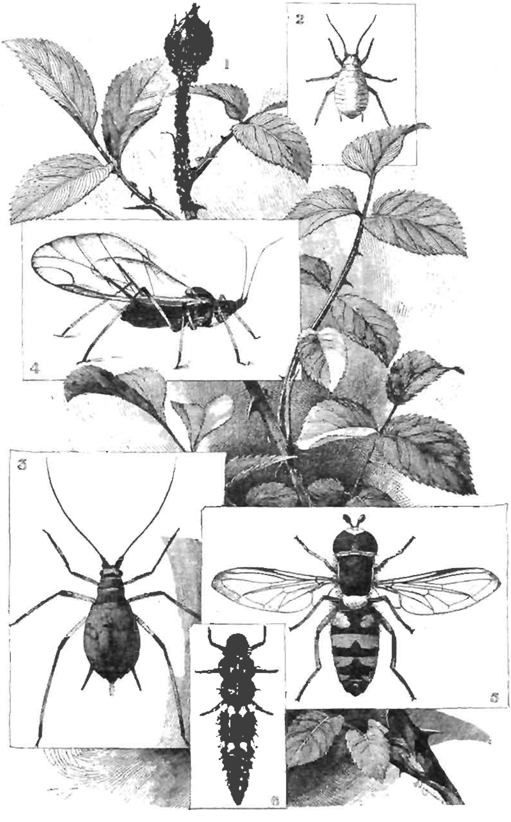

Fig. 27.—The Rose Aphis and its Parasites.

1. Spray of Rose-bush attacked by Aphis.
2. Larva of Rose Aphis.
3. Wingless Female Rose Aphis.
4. Winged Female Rose Aphis.
5. Hover Fly (*Psilopus Sydneyensis*).
6. Larva of Lady-bird Beetle (*Leis conformis*).

(After Froggatt).

FRUIT NOMENCLATURE.

The Pomological Committee of Australia.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley, Secretary.

At a conference of the Ministers of Agriculture, representing the various States of Australia, held in Brisbane in May, 1914, the following resolution was adopted:—

> "That a committee on fruit nomenclature be appointed, to consist of two representatives from each State appointed by the Government of each State, to meet as often as required, each to defray the expenses of its representatives, and the expenditure in connexion with the work of the committee to be jointly borne by the States. The chairman at each meeting to be one of the representatives of the State in which the meeting is held, and to have a casting vote."

Prior to that time, a committee on fruit nomenclature had been working in Australia under the auspices of the Australasian Fruit-growers' Conference. This committee consisted of two fruit-growers and one Government official, representing each State, and two meetings were held.

The first was held at the School of Horticulture, Burnley, Victoria, in April, 1913, and the second was held at Hobart, Tasmania, in May, 1914, concurrently with a large Inter-State fruit show, which had been organized so that the members of the committee might have the advantage of consulting the large number of exhibits of fruit in their work.

The effects of the Brisbane motion were (*a*) to supersede the committee appointed by the Australasian Fruit-growers' Conference, and (*b*) to appoint a committee under the auspices and control of the various State Governments.

The result is, that the work on pomological nomenclature is now being carried on under Government sanction and action, and it can now be worked on a firmer basis with official weight and decision.

That this action will be welcomed by the fruit-growers of Australia is shown by the following motion passed at the recent conference, which was moved by Mr. L. M. Shoobridge, of Tasmania, president of the Australian Conference of Fruit-growers, and seconded by Mr. H. Wicks, of South Australia.

> "That we appreciate very much the action of the various Governments of Australia in appointing this committee, as we feel that the more co-operation that can be obtained between growers and officials the more effective results will be obtained."

Pursuant upon the Brisbane motion of the Ministers of Agriculture, the newly-constituted pomological committee met at the School of Horticulture, Burnley, Victoria, on 25th, 26th, and 27th April, 1916.

The following delegates were present:—Mr. W. J. Allen, Department of Agriculture, New South Wales, and Mr. Tucker, President of the New South Wales Fruit-growers' Association, representing New South Wales; Mr. Geo. Quinn, Department of Agriculture, South Australia, and Mr. H. Wicks, representing South Australia; Mr. J. Ward,

Department of Agriculture, Tasmania, Mr. L. M. Shoobridge, and Dr. H. Benjafield, of Hobart, representing Tasmania; Mr. James Lang, J.P., Mr. F. W. Vear, and Mr. E. E. Pescott, Principal, School of Horticulture, Burnley, representing Victoria.

Queensland and Western Australia were not represented.

Mr. James Lang, J.P., was chosen as chairman.

In order to recognise the work done by previous committee, it was decided to adopt the two reports of the 1913 and 1914 sessions respectively; and so that the information may be readily available a summary of the work carried out is given here.

Change of Name.

APPLES.

Old Name	New Name
Five Crown Pippin	London Pippin.
Dumelow's Seedling	Dumelow.
Democrat	Tasma.
Dunn's Seedling / Munroe's Favourite	Dunn's Favourite.
Stewart's Seedling	Stewarts.
Schroeder's Apfel	Schroeder.
Emperor Alexander	Alexander.
Pomme de Neige / Snow Apple	Pomme de Neige.
Trivett's Seedling	Trivett.
Mellon's Seedling	Dunolly.
Yapeen Seedling	Yapeen.
Yeate's Nonpareil	Gowar.
Stayman's Winesap	Stayman.

PEARS.

Old Name	New Name
William's Bon Chretien / Bartlett / Duchess	Williams,
Napoleon / Vicar of Winkfield	Vicar of Winkfield.
Giblin's Seedling	Giblin's Nelis.
Kieffer's Hybrid	Kieffer.
Harrington's Victoria	Harrington.
Laffer's Nelis / Laffer's Bergamot	Laffer.

It has been long recognised that the nomenclature of fruits grown in Australia, particularly that of apples and pears, was considerably confused owing to the various names and synonyms which were given to the fruits; and it is actually upon record that the growers have suffered pecuniary loss owing to certain fruits being known under different names in the different States. The following quotation from the report of Messrs. F. W. Moore & Co. Ltd., Australian fruit merchants, Covent Garden, London, dated 28th May, 1914, says:—

> "We have again to say that some of the Tasmanian growers spoilt their chance by persisting in marking Cleopatras as New York Pippin. Hamburg buyers show a decided preference for Cleopatra, but they are not all keen judges of fruit, and when they see a case marked 'New York Pippin' are prone to think there is really a difference, particularly when they see the apples are green and hard, whilst those of the same variety from the mainland States are yellow and soft. There is still another

point to be considered: many buyers in the auction room hold commissions from fruiterers hundreds of miles away to buy Cleopatras; they dare not buy for their principals cases that are marked 'New York Pippin.' It has been done, but fruiterers have repudiated, the Courts have been appealed to, and, despite the evidence of those who know there is not any difference, the Courts have decided that the grower would not have marked his cases 'New York Pippins' if the fruit had really been Cleopatra. At Tuesday's sale there was a difference of at least one mark (frequently much more) in fruit of equal quality but different marking."

In regard to the apple Cleopatra it has been proved that it is the apple which is largely grown in America under the original name Ortley. The committee have been unable to ascertain the source of the

Exhibit of Fruit at Conference, 1916.

name Cleopatra, but it is known to have first been used in Victoria about the year 1872.

Then in regard to the apple which has long been known in Victoria as Munroe's Favourite, and as Dunn's Seedling in South Australia, it was also known as Garibaldi, Gander's Seedling, and Golden Cup in various districts in Victoria; while it had been re-named Ohinimuri in New Zealand. The action of the committee in changing the name to Dunn's Favourite has been questioned; but, on the evidence submitted, it was decided to recognise the name of the raiser, Mr. Dunn, of South Australia, and to drop the name of Munroe, for it was only introduced into Victoria from South Australia by Mr. Munroe, who never claimed to be the raiser. Forty years ago, in the absence of any knowledge of its correct name, the apple was in Victoria named "Munroe's Favourite" by Mr. James Lang, of Harcourt, Victoria.

The principal reason, therefore, for the appointment of the committee was that the names of Australian-grown fruits should be revised, and

that in time each fruit would be recognised by one name, and by one name only, throughout Australia.

A second, and equally important work, is the recognition and description of Australian-raised seedling fruits.

This is important, as it is the opinion not only of the committee, but of many other growers and experts, that the time is not far distant when a type and class of fruits of each family will be evolved in Australia which will be especially suited to the climate and soil conditions of Australia.

The extensive planting of the apples Dunn's Favourite, Rokewood, Granny Smith, Carrington, Bismarck, Shorland Queen, Statesman, Stewarts, and others goes far to support this belief.

Two other important features of the work of the committee are the publishing of a list of apples and pears suitable to be grown in the various States, and of a list of apples which are known to be blight-proof, or free from the insect woolly aphis, or nearly so.

At the 1913 meeting 328 dishes of fruit were staged; at the 1914, there were shown nearly 1,000 dishes; while at the 1916 meeting 1,039 dishes of fruit were exhibited.

In regard to fruit nomenclature, the following rules are considered by the committee as urgent:—

1. That the names shall be as simple as possible.
2. That wherever possible, one word only should be used as a name.
3. Duplication of names, or names possessing strong similarity, is to be avoided.
4. That such words as "seedling" and "hybrid" be abolished from Australian pomology as far as possible.
5. That priority of name, naming, or of origin, have preference wherever possible.

At the 1913-14 meetings the following names were approved of:—

Apples.

Cleopatra.
Scarlet Nonpareil.
King of Pippins.
Jonathan.
Cox's Orange Pippin.
Rymer.
Shorland Queen.
Maiden's Blush.
French Crab.
Gravenstein.
Rokewood.
Pomme de Neige.
Prince Alfred.
McIntosh Red.
Twenty Ounce.
Lady Daly.
Stone Pippin.
Alfriston.
Lane's Prince Albert.
Perfection.
Lang's Best.
Champion.
London Pippin.
Adam's Pearmain.
Dumelow.
Rome Beauty.
Peasgood's Nonsuch.
Yates.
Lord Wolseley.
Duke of Clarence.
Statesman.
Shepherd's Perfection.
Reinette de Canada.
Worcester Pearmain.
Granny Smith.
Lord Suffield.
Beauty of Bath.
Wealthy.
Winter Strawberry.
Warner's King.
Ben Davis.
Wagener.
Gascoigne's Scarlet.
Sutton.

PEARS.

Vicar of Winkfield.	*Glou Morceau.*
Le Lectier.	Duchess D'Angoulême.
Doyenne du Comice.	Winter Nelis.
Giblin's Nelis.	Madam Cole.
Winter Cole.	Elizabeth Cole.
Beurre Bosc.	Beurre *Capiaumont.*
Josephine de Malines.	Howell.
Packham's Triumph.	Packham's Late.
Beurre D'Anjou.	Clapp's Favourite.
Urbaniste.	Beurre Superfin.
Durondeau.	Thompson's.
Conference.	Beurre Diel.

At these meetings the following resolutions were adopted:—

1. That it be suggested to the Australasian Fruit-growers' Conference that models be made of typical fruits, to be selected by the pomological committee from the approved and confirmed varieties; that outline, sectional, and complete photographs be taken of each, and that sets of models and photographs be obtained and retained by each State Department of Agriculture.

2. That it be a recommendation to the Australasian Fruit-growers' Conference that the work of tabulating and historically recording all Australian seedling fruits and sports be delegated to this committee.

3. That no specimen of fruit be received by the committee for naming unless at least six specimens be forwarded, accompanied by full particulars, as far as possible, of origin, habit of tree, soil, locality, &c., and the name, if any, under which that fruit is grown. Such specimens to be forwarded through the various departmental officers of the committee.

4. That the various Government officers be asked to bring under the notice of their Departments the advisability of having photographs and models made of the various accepted fruits.

5. That a list of the principal commercial varieties of apples and pears suitable for planting, and their names as decided by the pomological committee, be submitted to the Australasian Fruit-growers' Conference, and that the conference be strongly urged to do its utmost to get growers in the different States to ship only under these names.

6. That each departmental officer shall prepare a list of apples which are resistant to the woolly aphis, such list to be forwarded to the president for publication in 1915.

A further business of these meetings was the preparation of a list of the principal varieties of apples and pears suitable for planting in the different States. This list was supplied by the members of the committee representing each State, and it has already been published.

1916 Meeting.

At this meeting the following resolutions were carried:—

1. This committee expresses its appreciation of the action taken by the Ministers of Agriculture in regard to the appointment of a permanent pomological nomenclature committee, thus acknowledging the work already done. The members would respectfully suggest that in addition to the two members already appointed an additional fruit-grower and

one fruit tree nurseryman from each State be nominated to assist the committee in its deliberations.

Note.—The committee does not ask that the Governments concerned should pay the expenses of these additional members. Such expenses, it is anticipated, would be borne by the bodies they represent. The reason that the committee makes the recommendation is that they feel the extra assistance would not only strengthen them, but would greatly facilitate the work of the conference.

2. That the Ministers of Agriculture be asked to write to the States not represented at this meeting stating that in view of the important work being carried out by the committee, they be asked to join in this work in the future, especially as in the case of Western Australia considerable work has been done by the committee for that State.

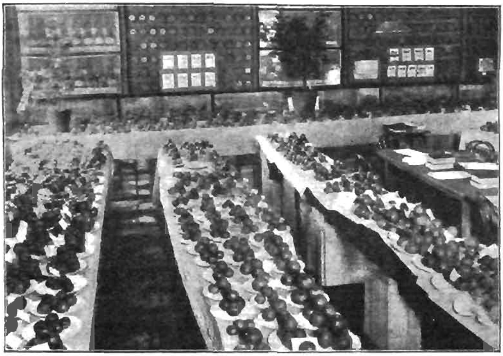

Exhibit of Fruit at Conference, 1916.

Note.—Three conferences have been held: Queensland was represented once, while Western Australia has not been represented at all.

3. The committee respectfully suggests to the Ministers that it be empowered to invite any prominent fruit-growers or nurserymen to attend the meetings as visitors, and to assist in the deliberations and discussions.

Note.—The presence of fruit-growers and nurserymen with special knowledge would be of great value to the committee. They would have no vote, and no expenses would be allowed them.

4. That this committee affirms the desirability of issuing certificates of merit to Australian-raised seedlings, and suggests to the Ministers of Agriculture that the committee be instructed to prepare a scheme to that end.

5. Before the committee recommends any seedling for an award samples of fruit must first be submitted for approval, together with full details as to the habits of the tree, and the immunity of the fruit and tree from disease. If it then be found that such fruit is worthy of a trial the committee would then recommend that the variety would then be treated at one of the Government orchards in the various States, particularly in the State in which the fruit is said to do best, and an annual report furnished to the committee by the members on the same. This refers more particularly to apples and pears than to soft fruits.

6. That the Minister of Agriculture for Victoria be asked to authorize and arrange for the despatch of certain fruits grown in Australia the nomenclature of which is much confused to the Royal Horticultural Society of England, for consideration and report by the fruit committee of the society, the originals of these fruits having been raised in and exported from Great Britain to Australia.

Note.—The committee selected four fruits this year—Broompark, Eyewood, and Black Worcester pears, and Strawberry Pippin apple.

7. That the members in the separate States form local State sub-committees to consider any seedling or new soft fruit that may be brought under notice, each sub-committee to record and report to each meeting of the general committee.

Note.—The time at which the committee meets, viz., about Easter, precludes the committee as a whole considering soft fruits for the present. No extra expense will be incurred in carrying out this resolution.

8. That the papier mâché models made by Mr. James White be adopted, and that the Ministers be recommended to have 24 models made this year.

Note.—Mr. White's models are wonderfully good, and the committee is of opinion that they could hardly be improved upon.

9. That it is desirable for each State to take sectional and complete photographic records of Australian seedling fruits; such photographs, with every possible record of the tree and fruit, to be presented at each meeting of the committee.

10. That it be an obligation upon all members accepting their nomination that they attend every session of the committee.

11. That this committee adopts the two reports of the work of the previous committee.

12. That the next meeting be held in the State of New South Wales during the week after Easter of 1917.

13. Regarding resolution 9 passed by the Brisbane Conference of Ministers of Agriculture, May, 1914, the following resolutions have been passed:—

(*a*) That the committee would be pleased to receive any suggestions of improvements of the Australian fruit case accompanied by samples, but up to the present no definite suggestions have been received by the committee.

(*b*) Precooling of Fruit.—In the case of pears, arrangements should be made to ship this fruit in separate chambers, and then precooling is desirable, provided that the whole of the contents of any separate chamber is precooled. In the case of apples, precooling is not considered necessary.

14. That the best thanks of the committee be passed to the Victorian Department of Agriculture for the arrangements made in facilitating the work of the committee, and also for its entertainment.

15. The following motion was carried by the fruit-growing members of the committee:—

On behalf of the Australian Fruit-growers' Associations we desire to appreciate exceedingly the action of the various Ministers of each State in appointing the nomenclature committee, as we feel that the more co-operation we can obtain between growers, nurserymen, and officials the more effective results will be obtained.

Note.—The various Government representatives were asked to convey this motion to each Minister.

The committee then considered the exhibits, and arrived at the following decisions:—

Pears.

1. Broompark, as grown at Mylor, South Australia, is Muirfowl's Egg. Eyewood, from Mr. Wade, Lilydale, Tasmania, is Muirfowl's Egg. It is not recommended that this pear should be grown.

2. Hacon's Incomparable, as grown at Burnley, is not true to name.

3. *Broompark and Eyewood.*—In view of the confusion in the nomenclature of these two pears, it was decided to send samples to England for identification by the experts of the Royal Horticultural Society.

4. Princess, as grown at the Burnley Horticultural Gardens, is correct.

5. The pear grown in Tasmania as La Conte is Princess.

6. Le Conte, as exhibited by New South Wales, is correct.

Note.—It was decided that the name of the pear La Conte introduced by Nobelius is too similar to the name of the sand pear Le Conte, and the committee is of the opinion that the name should be changed.

7. Black Achan, Black Worcester, and Verulam.—Owing to the confusion of these three fruits they are all to be referred to England.

Apples.

1. Strawberry Pippin, from South Australia, is not Winter Strawberry Pippin. This apple was originally grown under the name of Somerset Lasting, which it is not; this fruit is also to be sent to England. Strawberry Pippin, as exhibited from Dr. Stewart, Latrobe, Tasmania, and L. M. Murdoch, Glenorchy, Tasmania, are different, and are not the Strawberry Pippin as exhibited from South Australia. The Strawberry Pippin exhibited from New South Wales, from Mr. Wade, of Tasmania, and from Mr. L. M. Shoobridge, are identical. This fruit will be reported upon next year.

2. Newman's Seedling (originally Neumann), grown in South Australia.—There were four exhibits of this fruit, which is ready for export at the end of January. The following motion was carried:—"That the South Australian apple Newman is inferior to the apple Newman imported from America and grown at the Bathurst Experiment Farm, and that the committee does not recommend the growing of the local apple, to any extent. The New South Wales specimens of Newman's were correctly named.

3. Carrington and Lady Carrington.—The name Lady Carrington should not be used. There are two types, red and streaked. These are blight-proof, and are sometimes used for stock, instead of the Northern Spy. Aitken's Seedling, which is not blight-proof, is frequently sold in Victoria as Carrington. Mr. Allen will submit specimens of the complete set of these apples to the next meeting.

4. Dutch Mignonne.—The South Australian and Harcourt samples were correct. The Tasmanian specimens are to be considered next year. The apple grown in the Burnley Horticultural Gardens as Dutch Mignonne is the South Australian apple Beauty of Australia. This apple takes black spot freely. The apple grown in New South Wales as Beauty of Australia is entirely different from the South Australian variety.

5. Garibaldi.—This apple was raised at Uraidla, in South Australia. There were four exhibits from Tasmania and one from South Australia. The exhibits were all different. The South Australian specimens were accepted as correct, but the apple is not recommended for planting. It is possible that the Tasmanian specimens may be Ridgway's Red. This fruit will be considered next year.

6. Crofton.—This apple was raised in Tasmania, and is one of Tasmania's best seedlings. It is an excellent apple, and good for cool storing; it takes aphis only slightly. The name Crofton was adopted, and the fruit recommended for planting in cool climates for late dessert purposes.

7. Foster, raised in Gippsland, Victoria.—Reputed blight-proof, and is possibly a seedling of the Northern Spy. Although there are several American apples of the same name, the committee decided to retain the name Foster, and not recommend it for export planting.

Consideration of Seedlings.

The following seedling apples and pears were forwarded to the committee for consideration:—

1. Beauty of Australia or Australian Beauty.—This is a chance seedling raised in South Australia by Mr. Bonython, of Summertown; it takes black spot badly and woolly aphis slightly. On account of the fact that the fruit has been exported to England satisfactorily, the committee approved of the naming of the seedling.

2. Glenone.—An apple raised by Mr. McKeown, of Dromana, Victoria. It is a seedling from Oslin, and is reputed blight-proof, and also that the wood will strike from cuttings. The name was approved of, but the apple was not recommended for general planting.

3. Streamville, raised by Mr. Murphy, of Arthur's Creek, Victoria.—It has been shipped successfully; it is a fair quality apple, and has a good colour, and will be reported upon at next meeting.

4. Croton, raised Ranelagh, Tasmania.—Several cases shipped to England brought 15s. a bushel. It grows well on poor soil, and is fairly free from woolly aphis; was awarded first prize at the Inter-State Fruit Show, Hobart, 1914, as a new variety. The name was confirmed.

5. Mayhew's Seedling.—There was nothing of special note in this apple. It was decided to hold it over for consideration at next meeting.

6. Cowell's Red Streak, raised in New South Wales.—An early apple, free from woolly aphis; reported as a valuable early apple for the New South Wales warm coastal climates.

7. Brown's Pippin, Peck's Seedling.—Two blight-proof apples from New South Wales. Were deferred for consideration next year.

A large number of seedling apples and pears were considered and rejected by the committee as being inferior to existing varieties in commerce.

Blight-proof Apples.

The following list of apples which are reported as being immune from woolly aphis, or nearly so, from various States, is issued by direction of the committee:—

Alexander.
Annie Elizabeth.
Bonum.
Carlton.
Cliff's Seedling.
Climax.
Commerce.
Early Richmond.
Foster.
Fall Beauty.
General Carrington.
George Neilson.
Gravenstein.
Hay's Midseason.
Irish Peach.
John Sharp.
Kenny's Autumn.
Lady Carrington.
Lang's Best.
London Pippin.
Lord Wolseley.
Magg's Seedling.
Marjorie Hay.
Menagere.
Mona Hay.
New England Pigeon.
Nickajack.
Northern Spy.
Perfection.
Pomme De Neige.
Purity.
Reinette Du Canada.
Ruby Pearmain.
Sharp's Early.
Sharp's Nonsuch.
Springdale.
Striped Beefing.
Takapuna Russet.
Trivett.
William Anderson.
Winter Majetin.
Winter Strawberry.
Yarra Bank.

POTASH FROM OLIVE OIL RESIDUES.

From analytical results published in the *L'Italia Agricola* by A. Aita, olive oil residues (the blackish, turbid liquid deposited at the bottom of the sink under oil presses) contained the following:—Soluble in water, 13.57 per cent., alkaline chlorides 1.57 per cent. The amount of potash in the liquid is given as about 1.5 per cent. or slightly more. By the evaporation and combustion of 100 gallons of this residue 30 to 35 lbs. of ash were recovered. The volume of the liquid is double that of the olive oil produced.

A Commission has been formed to consider the possibility of utilizing this residium for the manufacture of potash salts.
—Extract *Journal Industrial and Engineering Chemistry*, May, 1916.

Roughly, 10,000 gallons of this liquid would produce, on the figures given, approximately 1½ tons of ash, the potash content of which would make it worth £2 10s. per ton at the present price of potash.

NOTES ON PORTUGUESE WINE VARIETIES.

By F. de Castella, Government Viticulturist.

(Continued from page 570.)

Touriga.

Touriga, which is at the present time the most popular variety in the Alto Douro or Port wine district of Portugal, differs considerably from the sorts described in the two previous articles. Alvarelhao, so largely responsible for the "dry finish" of a true Port, yields a wine light in colour. The wine made from Bastardo rapidly loses its colour, in the same way that a "Grenache" does. Touriga, on the other hand, yields a wine rich in colour, and, in spite of the opinion of some old Portuguese writers to the contrary, its colour seems to possess considerable stability. In addition, it is a good and regular bearer, setting its fruit well, and little liable to spring frosts.

To these qualities are no doubt due the great popularity Touriga now enjoys. At the time of the writer's visit to the Alto Douro district, in 1907, it was generally looked upon as the leading port wine grape, though, in order to obtain all the qualities characteristic of this remarkable wine, the admixture of a certain proportion of other sorts appeared to be indispensable.

It is probable that it will prove to be a dual purpose vine, equally valuable for the production of dry and of sweet wines, in much the same way as Syra, better known as Shiraz, in Australia. Though Touriga is so largely grown for conversion into sweet wine in the Port wine district, it is also capable of yielding dry wines of excellent quality, as witness those of Dão (Portugal) made from the same grape. A dry red wine, made from this grape, was tasted by the writer at the Quinta de Malvedos;* it strongly resembled a dry Rutherglen Shiraz, suitable for export, and suggested the idea that Touriga may prove of value for the production of dry as well as of sweet wines in Australia. Mr. Burney's experience of this vine is most interesting, especially as regards the quality its fruit possesses of hanging on the vine, when fully ripe, without wasting, a point of great importance in a warm, dry vintage.

Is Touriga destined to displace Syra as the most generally useful wine grape in North-East Victoria? Time alone can tell. This is, to say the least, by no means impossible. Our present experience of the variety is such that it can be confidently recommended for propagation on a large scale with certainty of satisfactory results.

The following extracts from Portuguese writers concerning this promising grape may prove of interest. It will be seen that Touriga has steadily increased in popularity; largely, no doubt, in consequence of the growing favour for Ports of darker colour in the early part of last century, when it became the fashion to bottle and lay down "vintage" ports. The earlier writers are not in accord concerning several technical points in connection with this grape, as will be seen.

* A sample of this wine was submitted at official wine tastings in Melbourne and Rutherglen and was highly thought of; on analysis it was found to contain 24·5 per cent. proof spirit, 23·6 grms. per litre total extract, and ·64 per cent. total acidity (as tartaric). See p. 20, Report of Department of Agriculture, 1907-10, sample No. 24.

These earlier writers are also less enthusiastic concerning its virtues than later authorities.

According to Rebello da Fonseca (1791)—

"Touriga is a vine of copious yield, it ripens early and is said by those who are enthusiastic concerning it (*os apaixonados d'ella*) that it makes a wine with much colour. Nevertheless, it has been proved that after a certain lapse of time a wine which contains much of this grape becomes much discoloured (later writers dispute this); the greatest virtue I recognise in it is its copious production, even in poor soil; it requires, however, the same caution as regards pruning as Tinta Castellam," viz., very short pruning, to two or three spurs, each of three eyes.

Rubiao (1844) also recommends short pruning for it. Villa Maior is less drastic. He says—

"The bunches of this variety are borne always on the five first buds of the cane, there being frequently three bunches on each shoot. For this reason the

Fig. 7.—Leaf of Touriga (nearly half natural size).
Photo. taken at Rutherglen Viticultural Station, April 1913.

rod should always be pruned at the seventh eye The second variety of Touriga (Tourigao) produces its bunches at the last eyes and requires longer pruning.

Gyrao (1822) has a higher opinion of Touriga than Rebello da Fonseca. He mentions three sub-varieties of it, of which that named *fina*, or choice, is the best. (This is the one which has been introduced into Rutherglen.)

"It requires well exposed and strong soil; it yields an excellent wine with *much colour; it is anneira, that is to say*, it only bears well every second year."*

* Conselheiro Aguiar (1866) differs; he distinctly states that Touriga is not Anneira—see later.

He describes two other sub-varieties under the names of Tourigao or Tourigo Macho (male) and Touriga Foufeira, and suggests that they should be rooted up and replaced by layering. He advises against grafting them, "because they possess the singular property of not being capable of correction by way of grafting; even if grafted with the most excellent Touriga, they always remain the same; the nature of the stock or trunk triumphing over that of the scion."*

" Villa Maior (1849-77) speaks very highly of Touriga. He refers to the little esteem in which it was held by Rebello da Fonseca—

"but what did he mean by Touriga? There seems no doubt that it was really Touriga he was writing of but in this case it is necessary to state that his opinion is contrary to the very positive results of long experience in the higher portion of the Alto Douro, that same region which I am describing, where the variety called Touriga is recognised to possess incontestable merits; so much so, that the rehabilitation of the viticultural reputation of several vineyards is attributed to it." He adds that this remark only applies "to the one primitively called Touriga which is one of the choicest and best we know."

He is emphatic as to the importance of selecting the choicest varieties in order to insure quality in the wine. "It is not alone on the wine making that the quality of the wine depends, but mainly on the richness of the grapes produced by special varieties of vines grown under the influence of a favorable climate and of a soil appropriate to its particular nature." Notwithstanding the opinion of Pliny and those writers who hold that the soil plays the leading part, he points out "that it is powerless to enable a choice wine to be extracted from a coarse or even from a mediocre grape. The vine-grower is powerless to change his soil or climate, but, on the contrary, he has free choice of the varieties best suited to the special conditions of these."

He quotes the well-known opinion of Dr. Guyot concerning the predominant part played by variety, concluding with the following curious passage, of special interest to Australians:—"I can myself testify to the truth of this as I had occasion to state in my report concerning the Paris Exhibition of 1867. Speaking of the wines of Southern Australia, the wines of New South Wales and those of Victoria, made exclusively from good varieties imported from Burgundy and the Medoc, *showed the distinctive character of the wines of these last-named regions.*"

Writing in 1873 the same writer states "Touriga is one of the varieties most highly esteemed in the Douro vineyards, mainly in the region between Tua and Pinhão, where, together with Tinta Francisca and Mourisco Tinto, it serves to produce the most generous wine."

He states that ripe Touriga grapes produce on an average 55.7 per cent. of must of a gravity of 1.115 (15° Beaumé) containing 24 per cent. of sugar and .34 per cent. of acids (as sulphuric).

As further proof of the high quality of Touriga he states that "the vineyards of Soutello, in the Pesqueira district, were formerly planted with mixed varieties of low grade, furnishing mediocre wines. A well-known proprietor, Sr. Bento de Querios, knowing the precious qualities of Touriga, caused this variety to be propagated in his vineyards by grafting, with the result that to-day Soutello yields excellent wines of the highest class."

Villa Maior further refutes Fonseca's poor opinion of Touriga—"What that author said of the little permanence of the colouring matter of Touriga wine has not been confirmed since we are better acquainted with this variety."

Mas and Pulliat (1877) quote Villa Maior as saying that Touriga "is a variety much appreciated in the upper part of the Douro region, which produces the best wine of Portugal, because its yield is very regular, and because it gives to the wine a most agreeable taste of fruit, reminding of that of a Reinette apple. It is, together with Tinta Francisca and Mourisco Tinto, the dominant vine in these vineyards."

* This is in contradiction with modern scientific views concerning grafting. French scientists deny that *specific variation*, in other words, a durable change, can be brought about in the scion through the agency of the stock. Possibly the faulty Touriga vines referred to were affected with the obscure disease, known in France as *Court Nové*, which seems to be similar to what we know as "Rogue" vines in Victoria.

According to Count Odart, it is the variety which contributes most to the good quality of the Douro or Porto wines, and principally by its fine colour.

Conselheiro Aguiar (1866) states that Tourigo is late (Serodia), of abundant production, not *Anneira*, and that it ripens its fruit from first to fifth October. It prefers soils of medium strength, and yields poorly on cold soils. He deals with the three sub-varieties mentioned above.

Oliveira Junior (1871) states that—

"Of the different varieties cultivated on the Douro, Touriga has been observed to best resist unfavorable climatic conditions; in addition it has another and not less valuable advantage: that of yielding abundantly. These two advantages lead us to recommend its propagation in substitution of other sorts which do not combine these conditions. Some growers, realizing this, are proceeding to graft."

Cincinnato da Costa deals at some length in *O Portugal Vinicola* with Touriga, which—

"May be considered one of the most precious black grape of the Douro region. It is known as *Tourigo* in the adjoining province of Beira Alta and

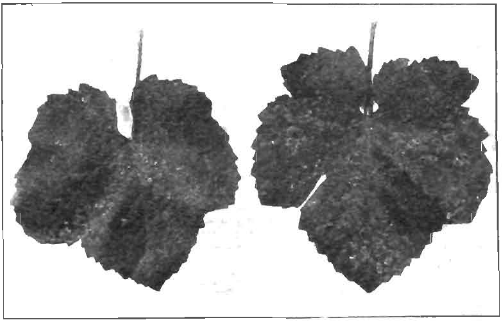

Fig. 8.—Leaves of Touriga (about one-third natural size).

Photo. taken at Quinta da Boa Vista, Alta Douro, Portugal, in October 1907. The leaves are spotted with Bordeaux mixture, sprayed to prevent Downy Mildew (*Plasmopara viticola*).

Azol in Minho. On the Douro it is known as Touriga Fino to distinguish it from two other sub-varieties, viz., Tourigão, Tourigo or Touriga Macho (male) and Touriga Fourfeira, which are inferior."

"Touriga is a variety of which the value is well known and justly appreciated in the north of the country for the quality and quantity of its yield. It is one of the typical sorts of the Douro region where it forms an integral part of the principal vineyards. It seems here to be so well suited to the prevailing conditions that it is the one which best resists adverse weather conditions."

"In the Beira region (further south) especially between the rivers Mondego and Dão where the wines have a character of their own and are justly celebrated, Touriga is the predominating variety and the one from which are mainly derived the notable qualities which characterise the wines of the vineyards which fringe these rivers."

It is interesting to note that the wines of Dao are not sweet wines of Port type, but dry red wines, after the style of a French Burgundy.

The article on Touriga in "Ampelographie" is contributed by Sr. Duarte de Oliveira, one of the leading Portuguese viticultural authorities at the present time. He is an enthusiastic admirer of this valuable vine, as will be seen from the following abridged extracts:—

Souzão* and Touriga are really contemporaries—their culture extended on the Douro and in Tras os Montes when the Port wine trade, mainly in the hands of London merchants, demanded highly coloured wines to blend with those of France, which, in spite of their excellent quality, lacked the colour sought after on the London market. When the wines of Porto were first introduced into England they were used to improve (*concertar*) weak French wines. . . . In the reign of William and Mary, before war between England and France, the annual English consumption of Port amounted to 500 pipes.

In a footnote the following interesting particulars are given:—"The British preference for Portuguese wine received a strong stimulus from the Methuen treaty. In 1817 Port wine paid a duty of £27 5s. 3d. per ton as against £56 5s. charged on French wine. According to Dr. Halley, these circumstances have so encouraged the wine trade that the Portuguese have begun to seriously develop the cultivation of the vine; their plantations soon occupied a surface of 30 or 40 leagues on both banks of the Douro, so that owing to this trade, the wealth of the country (Portugal) has increased simultaneously with its population!"

The name Touriga seems to be a modification of Tourigo, a village in Beira Alta, where it seems to have originated. In the south of Portugal a variety called Tourigo is much cultivated, similar, if not identical, with Touriga.

Sr. Duarte de Oliveira denies the supposed identity of Touriga and Cabernet, which was asserted by some earlier writers; he also holds that Villa Maior is wrong in giving *Azal* as a synonym. The two varieties have really nothing in common.

He quotes Lacerda Lobo, who states that "Touriga was already, in 1790, to be found in several vineyards of Tras os Montes and Douro, the two provinces which produce the wine exported under the name of Porto—a name which justly enjoys a universal reputation. There is thus no doubt that Touriga is a variety which belongs to the first epoch of the Renaissance of Portuguese viticulture.

Though widely distributed throughout Portugal it is more particularly in the Port wine district that its value is thoroughly recognised. In a vineyard where no Touriga is grown the wine loses much of its commercial value. Even before Phylloxera, on both banks of the Douro, from Regoa to the Spanish border, this variety predominated in all the vineyards, proprietors forestalled the desire of the purchaser by assuring him that their wine contained much Touriga. Its name was sometimes a sort of passport for wines of doubtful quality.

With reconstitution, Touriga was somewhat neglected; but, after a while, it was recognised that it could not be overlooked if a good price for the crop was desired. And so Touriga began to be grafted everywhere, and now it is regaining, day by day, the lost ground.

In Tras os Montes, a viticultural branch of the Douro, Touriga is beginning to reconquer the ground. Within a few years this province will produce wines surpassing some of those of the Douro, which had an established reputation, but in connexion with which the choice of the best scion varieties had been neglected.

Touriga is not one of the first sorts to come into leaf in spring, and its buds are fairly resistant to spring frosts. It blossoms late, stands bad weather well, and rarely fails to set its fruit. It should be pruned long on good soil, but may be pruned short on dry hill sides. In such a situation the yields suffers if manures are not applied.

Touriga appears to bear much more heavily when grafted on resistant stocks than on its own roots. A case is mentioned of Touriga grafted on A.R.G.1, which yielded over 700 gallons per acre, whereas the same variety on its own roots alongside only bore half as much. It resists oidium well.

* Souzão is a Portuguese variety, mainly remarkable for the intense colour of the wine yielded by it.

Some of the authors mentioned above are quoted, as well as some others, all of whom look upon Touriga as a Port wine variety of the *very first order.* Sr. Duarte de Oliveira *continues*—

In order that the wine of Touriga may possess all its quality, complete maturity of the fruit must be awaited; the wine is then very alcoholic, of rather light body, and of a brilliant red colour, darker than the famous Cabernet Sauvignon, than which it has more body and character.

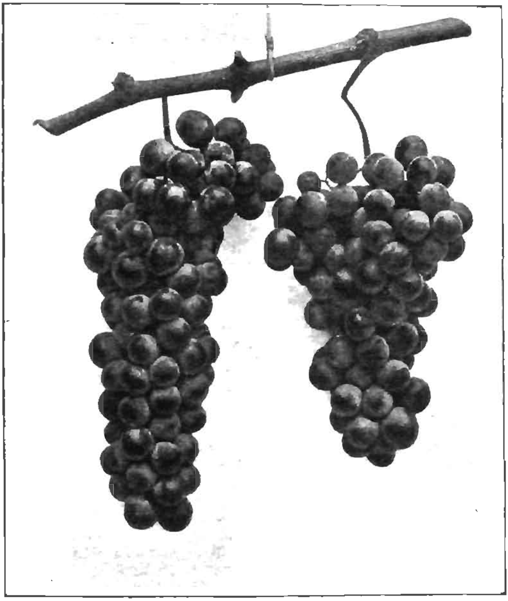

Fig. 9.—Bunches of Touriga Grapes.

Reproduced from *O Portugal Vinicola* by B. C. Cincinnato da Costa, reduced to half natural size.

The following ampelographical description is given:—

Vine.—Very vigorous; main stem cylindrical or slightly flattened; old bark brownish-red, easily detachable in short and narrow strips.

Buds.—Strong, with young leaves golden white, silky on both sides, with a rosy carmine edge; three-lobed at first, but the five lobes are distinctly visible on the third leaf.

Canes.—Medium, semi-erect, pale glossy green and glabrous whilst still herbaceous, light-brown when the wood is ripe, moderately striated; internodes medium, from 8 to 10 Cm. (3 to 4 inches) long; buds slightly prominent, not brittle; tendrils numerous, large, bifurcated.

Leaves.—Five-lobed, of medium size, as long as broad; limb not bulgy, dark-green, slight cobweb like tomentum above; under surface very cottony, whitish; substance of leaf pliable, velvety to the touch, reminding of chamois leather; first and second sinus deep, almost U-shape; petiolar sinus open, sometimes narrow, almost closed, so that the edges of the lobes touch; veins not prominent; teeth shortly mucronate, tinted with pale-yellow. Leaf-stalk long, glabrous, reddish. In autumn, after vintage, the leaves become yellowish-green, with bands of bright-carmine.

Fruit.—Bunches of medium length, cylindro-conical, fairly loose, short; stalk branched, bearing frequently another bunch almost as large as the principal one, but not shouldered; pedicels long, thin; core short, reddish-yellow at the centre; stalk very long, fairly strong, and generally flattened.

Berries.—Almost spherical, of irregular size, small rather than large, bluish-black; pulp soft, juicy and perfumed; skin hard, rich red colour; pips per 100 berries—44 with one each, 48 with two, and 8 with three.

(To be continued.)

THE USE OF LITTERS IN SAVING NATURAL MANURES.

Various litters are in use, mainly for bedding, but in some cases for absorbing liquid excreta and in the subsequent disposal of the manure a large amount of this litter is sold.

Litters in common use are cereal straw, shavings, sawdust, and bracken fern.

In an article under the heading of "Some Effects of Litter on the Fermentation of manure," by W. E. Tottingham, appearing in the *Journal of Industrial and Engineering Chemistry*, June, 1916, the results of some very interesting experiments are given.

The author used oat straw, oak shavings, and pine shavings as litter, and one part of fresh horse excreta with two parts of fresh cow excreta as a manure.

The results, after twelve weeks' fermentation, proved the manure with oat straw as litter to contain 17.94 per cent. humus, with 9.5 per cent. soluble nitrogen, whereas the manure containing oak shavings litter contained 12.07 per cent. humus and 5.91 per cent. soluble nitrogen, whilst the manure with pine shavings litter contained 11.81 per cent. humus and 5.67 per cent. soluble nitrogen.

In addition, the bacteria in 1 gram of the oat straw manure was 12.7, against 3.7 and 4.7 in the cases of the oak shavings and pine shavings respectively. The results of field experiments conducted by Professor E. B. Hart coincide with the above laboratory experiments—the increased yield from the oat straw litter manure being approximately 10 per cent. higher than that where oak and pine shavings were used as litter.

The results presented seem to furnish argument regarding the value of some litters at present in use, and certainly interesting particulars would be supplied by an investigation on the subject of the use of other litters.

NOSEMA APIS IN VICTORIA.

By F. R. Beuhne, Government Apiculturist.

Nosema apis, an animal parasite of the digestive tract of the honey bee, and the cause of a disease fatal to bees in Europe, was first discovered in Victorian bees in 1909. (*Journal of Agriculture*, January, 1910, p. 58.) Following, as it did, upon a heavy mortality of bees which occurred in the Stawell district during the winter and spring of 1909, the discovery of the Nosema parasite in Victoria caused some alarm amongst beekeepers.

The investigations made in Great Britain proved that the parasite when introduced into healthy bees produced the disease known there as Isle of Wight Disease. A comprehensive report of the investigations was published by the British Board of Agriculture in May, 1912. The authors of this report (p. 126) recommend the destruction of the bees and combs of affected hives as the only effectual means of dealing with this disease.

As the Victorian investigations, which were made by Mr. W. Laidlaw, B.Sc., Government Biologist, after the discovery of Nosema in Victoria, proved that the parasite was present in almost every apiary, that even wild bees in trees were affected, it appeared, therefore, hopeless to attempt the eradication of the disease by destroying the infected bees and combs.

Bees from eighty-eight widely-separated apiaries were examined and the presence of the Nosema parasite proved in all but two, one of which was the departmental apiary at the Burnley School of Horticulture. In several instances the bees which showed Nosema infection came from apiaries in which no mortality or dwindling ever occurred, and it appeared, therefore, doubtful whether the presence of the parasite in the bees is in itself necessarily fatal, or that it greatly interferes with the productiveness of the hives excepting under certain conditions due to climatic influences.

In view of the wide distribution of Nosema in Australia, the fact that losses occur only after drought seasons, and that no fresh outbreaks of the disease followed the restocking with bees of defunct hives, it would appear that under normal climatic conditions this parasite is, in Australia, merely a casual inhabitant of the alimentary canal of the bee. In fact, under ordinary conditions the disease is endemic, and becomes epidemic only when the vitality of the bees is impaired by the malnutrition during the bee's larval development, which is caused by a dearth or the inferior quality of the nitrogenous food which bees obtain solely from the pollen of the flowers of plants.

The comparative harmlessness of Nosema apis in Australia during normal seasons suggested that the introduction of queen bees from infected stocks in one locality to colonies free from the parasite located in another district would not necessarily produce infection, and that affected dwindling colonies would probably recover in new and favorable surroundings.

With a view of arriving at some definite conclusion on this point, some tentative experiments were undertaken during the season 1913-14.

Queens and their escorts of worker bees from colonies proved to be affected with Nosema were introduced to several colonies at the Burnley apiary. No symptoms of disease developed, and Nosema was not found in bees from these colonies, examined by Mr. Laidlaw at intervals of two and three months.

To ascertain whether affected bees would recover on removal to a locality favorable to reproduction, an opportunity presented itself when, in October, 1914, the spring examination of the writer's apiary at Tooborac showed that, owing to the severe drought of the previous season, all the colonies were much weaker than is usual at this time of year, and that out of 180 colonies, 40 were in such poor condition that their ultimate recovery appeared to be very doubtful.

On 8th October, 1914, fourteen of the smallest of the dwindling colonies were removed to the Burnley Gardens. At the end of December they had recovered to normal strength, while of the twenty-six declining colonies left at Tooborac none had progressed appreciably, some had further declined, and two had been lost.

In view of the encouraging result obtained, the Chief Veterinary Officer directed that a further and larger experiment, with periodical microscopical examinations of bees from all the hives, should be made. Of the twenty-four affected colonies remaining at the Tooborac apiary, nineteen were transferred to the Burnley Gardens, five being left at Tooborac as controls.

The first microscopical examinations after the arrival of the bees at Burnley were made by Mr. Laidlaw in February, 1915, when the whole of the nineteen stocks were found to be infected with Nosema in various degrees. Bees from the five control hives at Tooborac were also examined and found to be similarly affected.

At the second examination made in May, 1915, only three showed Nosema, fifteen were free from it, and one had succumbed to starvation, while the five control colonies at Tooborac still showed Nosema infection, but of a lesser degree.

Owing to an unusual scarcity of nectar during March and April, it became necessary to feed the eighteen experimental colonies. This was done early in May, sugar syrup being given to fourteen and honey of unknown origin to four (Nos. 181, 186, 195, and 227). During August two colonies (Nos. 2 and 116) were lost through robbing started by the overturning of a hive.

Mr. Laidlaw made the third examination of bees from the sixteen remaining colonies, when it was found that twelve were free from Nosema, and four (Nos. 59, 186, 195, and 227) showed infection. Reference to the table A shows that three of these (Nos. 59, 186, and 227) were free from infection in May, and there is at least strong suspicion that they became re-infected through the honey fed (the infection of No. 59 being probably due to robbing from one of the honey-fed hives).

When the third examination of bees from the control hives at Tooborac was made in September, 1915, two of the five colonies had disappeared, but the surviving three were free from Nosema and in a thriving condition.

A further examination of bees from the four colonies still infected at Burnley was made by the Biologist on 18th and 29th January, 1916, when only one colony (No. 195) remained slightly infected.

The time for which the experiment was arranged having expired, the colonies experimented with were returned to Tooborac in March, 1916.

NOSEMA APIS INVESTIGATION

Summary of Microscopical Examinations made by Mr. W. Laidlaw, B.Sc.

Hive No.	1st Exam.		2nd Exam.		3rd Exam.		4th Exam.		Notes.
	Date.	Nosema Per Cent.	Date.	Nosema Per Cent.	Date.	Nosema Per Cent.	Date.	Nosema Per Cent.	
	1915.		1915		1915		1916.		
2	Feb. 11th	75	May 7th	40	Aug. 7th	Turned over and robbed out			Fed Sugar Syrup, May, 1915.
6	.. 22nd	15	.. ..	0	Sept. 23rd	0	.. ..	..	
16	.. 11th	70	.. ..	0	.. ..	0	.. ..	..	
40	.. 22nd	20	.. ..	0	.. ..	0	.. ..	..	
48	.. ..	25	.. ..	0	.. ..	0	.. ..	..	
59	.. 11th	85	.. ..	0	Oct. 8th	25	Jan. 18th	0	
83	.. ..	40	.. ..	0	.. ..	0	.. ..	..	
94	.. 22nd	10	.. ..	0	.. ..	0	.. ..	..	
110	.. 11th	70	.. 1st	Dead of starvation					
111	.. 22nd	15	.. 7th	0	Oct. 8th	0	.. ..	..	
116	.. 11th	90	.. ..	20	Aug. 7th	Robbedout			
129	.. 25th	10	.. ..	0	Oct. 15th	0	.. ..	..	
144	.. 11th	100	.. ..	0	.. ..	0	.. ..	..	
164	.. 22nd	50	.. ..	0	.. ..	0	.. ..	..	
173	.. 11th	35	.. ..	0	.. ..	0	.. ..	..	
181	.. 22nd	70	.. ..	0	Nov. 1st	0	.. ..	..	
186	.. 11th	85	.. ..	0	.. ..	25	Jan. 29th	0	Fed honey May, 1915.
195	.. 22nd	65	.. ..	15	.. ..	100	.. 18th	10	
227	.. 25th	55	.. ..	0	.. ..	45	.. ..	0	

CONTROL COLONIES LEFT AT TOOBORAC.

Hive No.	1st Exam.		2nd Exam.		3rd Exam.	
	Date.	Nosema Per Cent.	Date.	Nosema Per Cent.	Date.	Nosema Per Cent.
	1915.		1915.		1915.	
32	Feb. 5th ..	100	April 16th ..	25	Sept. 23rd ..	Dwindled out
41	.. .. ..	100	.. .. ..	55	.. .. ..	0
44	.. .. ..	90	.. .. ..	50	.. .. ..	0
185	.. .. ..	50	.. .. ..	35	.. .. ..	Dwindled out
212	.. .. ..	70	.. .. ..	10	.. .. ..	0

The experiment was started rather late in the season, and the conditions as to nectar supply were unfavorable. Pollen, however, was always plentiful, which enabled the colonies to completely recover, only one still showing Nosema when the hives were returned to their former locality.

It seems evident that the destruction of Nosema-infected bees and combs which is insisted on in Europe is not necessary in Australia. The cause of the lesser virulence of the Nosema disease is probably climatic, the drier atmosphere and the greater heat of the sun during summer arresting the progress of the disease.

Experiments made by Dr. F. G. White, of the United States Department of Agriculture, and published in *Bulletin No.* 92, showed that the Nosema germ did not survive a temperature of 57°C. (134.6°F.) continued for ten minutes.

This degree of temperature is easily exceeded out in the sun during our summer months, so that where hives are out in the open on ground kept bare and free of herbage and litter, sunlight perhaps destroys most of the spores in the surroundings of a Nosema-infected apiary.

A glance at the summary of microscopical examinations shows that even badly-affected colonies may completely recover under favorable conditions, but that one colony retained the parasite throughout, and may be considered a disease carrier.

It is probably such colonies which neither die out with the disease nor ever get rid of the infection, even under the most favorable conditions, which carry the parasite over a series of normal seasons, and act as nuclei of the epidemic after dearth of pollen in drought seasons has lessened the vitality and resistance of bees.

The table of control hives (B) shows that badly-affected colonies may recover without any assistance, provided sufficient bees survive till better conditions of food and temperature prevail.

To reduce as much as possible the chance and degree of infection, and thereby lessen the severity of epidemics, I would strongly advise beekeepers—

1. Not to locate hives in shady situations.
2. To keep the ground around the hives bare and clean.
3. To keep water from penetrating the hives during winter.
4. To re-queen all colonies which, from no visible cause, lag behind the average, and are therefore possibly disease carriers.
5. To use for re-queening only queens from stocks which, by their yields of honey due to the longevity of the workers, have proved their resistance to disease.

ARTIFICIAL FERTILISERS.

An impression of the enormous quantities of artificial fertilisers employed in the world before the outbreak of war is shown in figures published in England. The figures cannot be more than approximate, but they serve to show how dependent agriculture has become upon the fertiliser industry. 1. Phosphate of lime—The total production is estimated at about 10,000,000 tons, of which 8,000,000 may be attributed to superphosphate, and 2,000,000 to basic slag. This does not include the large quantities contained in guano, bones, &c. 2. Potash salts—The Stassfurt mines delivered potash salts in different forms equal to about 500,000 tons of pure potash. 3. Nitrate of soda—The shipments of this commodity from Chili amounts to about 2,000,000 tons a year, of which it is roughly estimated that three-fourths are for agricultural and one-fourth for chemical industries. 4. Sulphate of ammonia—The total production approaches 1,000,000 tons a year, which is employed for agricultural purposes.—*Canterbury Times.*

FARM MANUFACTURED BUTTER.

Its Moisture Content; and Some Factors which Influence it.

By E. E. Ash, Dairy Supervisor.

The law in Victoria, as it at present stands, allows up to 16 per cent. of moisture in butter. This is well known to the factory manager, who usually takes the necessary steps to see that the produce of his factory complies with the above regulation. But can the same be said of butter manufactured on the farm? There is good reason to suspect that a considerable quantity of the butter manufactured on the farms during the hotter months of the year would, if analyzed, show a moisture content above that allowed by the Act. The farmer does not overload his butter with water with the intention to defraud, but does it through ignorance. His knowledge of the factors which govern moisture content are small, and he has no means of ascertaining the amount of water the butter contains. Some conditions which favour an excess of moisture are outside the control of the butter maker, but others are directly under his control. A general knowledge of the whole subject cannot, therefore, be other than helpful to him. The mechanical condition or texture of butter is largely responsible for its moisture contents. Butter which is soft takes up and retains more moisture than hard or firm butter. Butter churned at a high temperature will, therefore, contain more moisture than that which is churned at a low temperature. Butter is composed of various fats and oils, one of the chief of which is olein. This is a fat somewhat similar to olive oil, which remains liquid at fairly low temperatures. The percentage of olein in butter appears to largely govern the texture or mechanical condition of the butter. Butter with a high percentage of olein is always softer than that in which some of the other fats (such as palmitin and stearin) predominate. The class of feed the cows get has a good deal to do with the composition of the different fats in butter. Foods rich in fats like oilcake, linseed, and the young grass in the spring, have a tendency to make the percentage of olein high, and incidentally to make the butter softer and retain more moisture. Foods like hay, roots, &c., usually make a firmer butter. The size of the fat globules in the milk also appears to have some influence on the firmness of the butter. Milk obtained from a herd of Jerseys contains larger fat globules than that from Ayrshires or Shorthorns. By this it is not inferred that butter made from a herd of Jerseys would necessarily contain a higher percentage of water than that obtained from Ayrshires or Shorthorns, but that there would be a tendency to a higher moisture content unless proper churning conditions were observed. The milk from newly-calved cows contains larger fat globules than that obtained from cows later in the period of lactation. It will thus be seen that there are many influences which may have an effect on the moisture contents of butter; but for all practical purposes the farmer need not concern himself about the size of fat globules, or the percentage of the different fats in butter. It is better for him to turn his attention to proper churning methods, and to the control of

temperatures during the whole butter-making operations. For the butter maker on the farm the summer is the trying time. Very few farms are equipped with refrigerating or cooling machinery. And great difficulty is experienced in getting the cream down to a sufficiently low temperature for successful churning, with the result that the butter is soft and greasy in texture and contains an excess of moisture. In addition, there is a considerable loss of butter fat when cream is churned at a high temperature. Though there is a number of factors which affect the moisture contents of butter, the principal one is the control of temperature. The moral is: Use the thermometer in butter-making operations, and don't guess at things. For summer churning get your cream down to as near 52 to 54 degrees as possible. And for washing and working purposes use the coolest water available

Do not attempt to feed young pigs on roots, especially raw roots, though a certain quantity might be used to supplement other feeding. Roots contain far too much water in the first place, and in the second place they contain far too little digestible albuminoids to nourish young animals and enable them to grow. If roots are to be used in any quantity, they should be supplemented by some dry food containing a high percentage.

The value of the butter exported from New Zealand in 1915 was £2,700,625, as against £2,338,576 in 1914, and the cheese exports were valued at £2,730,211, as compared with £2,564,125. The total value of the dairy produce exported in 1915 was £5,430,836, as against £4,902,701 in 1914, an increase of £528,135. The frozen meat exported totalled £7,794,395 in 1915, as compared with £5,863,062 in 1914, an increase of £1,931,333, or over 31 per cent.

Of all the organic nutrients in a fodder, fibre has the lowest feeding value. As a rule, fodder which has a high percentage of fibre has a low feeding value. Fibre, in so far as it is digestible, is used by the animal in the same way as starch, but in the majority of feeds the fibre is largely undigestible, and is consequently valueless for the nutrition of the animal, though it may be of some service in giving bulk to the feed—a point of some importance. But the farmers' coarse fodders always supply a sufficiency of this constituent, and there is no reason for purchasing it.

Carbohydrates is a chemical term to include starch and materials closely allied to starch chemically. Starch does not form muscle, or blood, or the curd of milk, or wool, but it furnishes, by its combustion within the body, the heat which is necessary for the existence of the animal. It is also a producer of energy or the capacity of work within the animal. But it is well to remember starch has not the same value as fat, weight for weight, as a heat and energy producer. Approximately 1 lb. of fat is equal to 2½ lbs. of starch for these purposes.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917.

Commenced 15th April, 1916; concluding 14th April, 1917.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.8.16	15.8.16 to 14.9.16	Total to Date (Five months).	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
1	G. McDonnell	White Leghorns	473	147	620	1
10	J. H. Duncan	,,	457	150	607	2
13	H. J. Meaddows	,,	466	138	604	3
7	C. J. Jackson	,,	481	119	600	4
25	A. H. Mould	,,	468	127	595	5
40	A. Brundrett	,,	451	139	590	6
36	E. W. Hippe	,,	451	135	586	7
41	Excelsior Poultry Farm	,,	444	132	576	8
27	John Blacker	,,	446	128	574	9
22	Mrs. H. Stevenson	,,	440	134	574	
38	V. Little	,,	432	132	564	11
24	Mrs. H. Mirams	,, (5 birds)	443	118	561	12
37	J. M. Smith	,,	420	137	557	13
28	S. Cheatle	R.C.B. Leghorns	427	129	556	14
17	W. G. Swift	White Leghorns	420	132	552	15
15	G. Laughlan	,,	411	134	545	16
44	J. Jamieson	,,	403	137	540	17
3	W. M. Bayles	,,	393	144	537	18
45	C. H. Oliver	,,	399	131	530	19
23	T. A. Pettigrove	,,	408	122	530	
14	W. R. Hustler	,,	392	131	523	21
30	F. T. Denner	,,	395	119	514	22
34	F. G. Silbereisen	,,	384	118	502	23
18	C. Ludwig	,,	376	126	502	
32	N. Burston	,,	377	122	499	25
39	L. McLean	,,	361	138	499	
6	J. J. West	,,	355	131	486	27
16	F. Collings	,,	356	128	484	28
12	G. Hayman	,,	339	139	478	29
26	Mrs. A. Dumas	,, (5 birds)	355	121	476	30
11	R. W. Pope	,,	328	144	472	31
29	A. S. Hyndman	,,	332	133	465	32
101	A. E. Silbereisen	,,	329	123	452	33
8	E. A. Lawson	,,	311	139	450	34
43	S. Buscumb	,,	298	149	447	35
19	Benwerren Egg Farm	,,	302	128	430	36
5	W. G. Osburne	,,	289	119	408	37
35	Tom Fisher	,,	242	121	363	38
20	H. I. Merrick	,,	248	114	362	39
9	W. H. Clingin	,,	225	128	353	40
33	E. F. Evans	,,	230	118	348	41
4	Fulham Park	,,	169	121	290	42
31	J. H. Gill	,,	135	127	262	43
		Total	15,861	5,602	21,463	
		HEAVY BREEDS.				
		DRY MASH.				
98	Marville Poultry Farm	Black Orpingtons	509	161	670	1
97	D. Fisher	,,	485	136	621	2
100	Oaklands Poultry Farm	,,	464	147	611	3
94	Mrs. H. Coad	,,	384	131	515	4
95	Mrs. T. W. Pearce	,,	346	138	484	5
96	H. Hunt	,,	280	138	418	6
99	J. Ogden	,,	181	132	313	7
		Total	2,649	983	3,632	

Sixth Victorian Egg-Laying Competition, 1916–1917—*continued.*

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.8.16.	15.8.16 to 14.9.16	Total to Date (Five months).	Position in Competition.
		LIGHT BREEDS.				
		Dry Mash.				
46	*W. H. Robbins*	*White Leghorns* ..	545	157	702	1
59	T. A. Pettigrove ..	,, ..	536	139	675	2
52	W. J. Thom	,, ..	493	160	653	3
56	Mrs. Nicoll	,, ..	493	123	616	} 4
53	W. N. O'Mullane ..	,, ..	470	146	616	}
70	G. Wilkinson	,, ..	465	137	602	6
58	C. Ludwig	,, ..	448	145	593	7
47	H. McKenzie and Son ..	,, ..	427	158	585	8
61	C. C. Dunn	,, ..	454	119	573	9
65	Izard and Tierney ..	,, ..	431	139	570	10
54	Mrs. A. O. Hughes .	,, ..	428	138	566	11
62	J. W. Morrow	,, ..	420	134	554	12
48	Thirkell and Smith ..	,, ..	374	134	508	13
69	E. A. Lawson .. .	,, ..	364	141	505	14
55	Rev. J. Mayo	,, ..	357	145	502	15
60	A. Greenhalgh ..	,, ..	359	131	490	16
67	Lysbeth Poultry Farm .	,, ..	339	136	475	17
49	C. Lane	,, ..	330	126	456	18
63	N. Burston .. .	,, ..	296	156	452	19
51	Reliable Poultry Farm ..	,, ..	284	128	412	20
50	Clevedon Poultry Farm ..	,, ..	276	133	409	21
66	Benwerren Egg Farm ..	,, ..	255	146	401	22
64	A. Bennett	,, ..	250	109	359	23
68	W. G. Osburne	,, ..	172	139	311	24
		Total ..	9,266	3,319	12,585	
		HEAVY BREEDS.				
		Wet Mash.				
74	Oaklands Poultry Farm ..	Black Orpingtons ..	570	150	720	1
89	Brooklyn Poultry Farm ..	,, ..	522	126	648	2
87	S. Buscumb	,, ..	477	148	625	3
92	J. H. Wright	,, ..	476	134	610	4
85	Mrs. M. Coad	,, ..	466	143	609	5
83	L. McLean	,, ..	453	145	598	6
80	Mrs. T. W. Pearce ..	,, ..	447	150	597	} 7
86	C. Ludwig	,, ..	450	147	597	}
88	A. D. McLean	,, ..	448	131	579	9
72	Marville Poultry Farm ..	,, ..	441	115	556	10
93	L. W. Parker	,, ..	421	127	548	11
90	Excelsior Poultry Farm ..	,, ..	371	157	528	12
91	N. Papayanni	,, ..	353	153	506	13
78	Reliable Poultry Farm ..	,, ..	358	145	503	14
77	Mrs. G. R. Bald ..	White Plymouth Rocks	340	127	467	15
81	K. Courtenay	Faverolles ..	342	101	443	16
84	H. L. Trevana	Rhode Island Reds	288	126	414	17
73	E. W. Hippe	,, ..	301	110	411	18
71	*C. E. Graham*	*Black Orpingtons* ..	*267*	*130*	*397*	*19*
76	L. A. Errey	Silver Wyandottes	273	119	392	20
82	J. Ogden	Black Orpingtons ..	201	139	340	21
75	Mrs. Drake	Rhode Island Reds	202	122	324	22
		Total ..	8,467	2,945	11,412	

MONTHLY REPORT.

Strong north winds and a good deal of rain were the features of the weather during the past month. The birds, however, have mostly laid very well, and are in excellent condition. Broodies were numerous among the heavy breeds, although in the light breeds only one bird went broody for the term. The necessity—owing to the severe weather conditions—of building the birds up to fairly high condition in the winter will materially aid in good averages for some time to come. Rainfall for month, 170 points. Temperature—Lowest 41 deg., highest, 74 deg.

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne, Victoria.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Cultivation.

Orchard ploughing should now be finished, and the main work for the next few months will be an endeavour to keep the soil surface loose, friable, and well opened. The consolidation of the surfaces must be avoided, as a hard, compact surface means the loss of much soil moisture, by capillary attraction. So that after rains, heavy dews, the spray pump and other traffic, it will be as well to run the harrows over the surface of the soil, so as to keep the surface well broken and to maintain a good earth mulch. If the harrows are not sufficient to break the clods, a spiked or heavy roller should be drawn over it, and then harrowed. If the weather is at all dry it is advisable to plough only as much as may be harrowed in the same day. By immediately following up the ploughing with harrowing a minimum amount of moisture is lost by capillarity.

Green manure crops should now be ploughed under, and should they be very abundant in growth, a roller should be run over them and ploughed with a coulter attached. Any of these means will serve to get the crop underground, which is a desideratum.

In addition to the retention of soil moisture, cultivation of the orchards will suppress the weeds which rob the trees of food and moisture. The suppression of weeds is an important work in the spring and summer, and they should be rigorously hoed or cultivated out.

Spraying.

Spraying for all pests and diseases is, at this time of the year, an important work in the orchard. Bordeaux spraying for the black spot of apples and pears, for scabs and shothole in peaches and apricots, for the leaf curl of the peach and rust of the plums and peaches, should now be completed.

Where there are indications that previous sprayings have not been thoroughly successful, a lime sulphur spray should be given.

Wherever they are present, nicotine sprays should be given to combat the peach aphis, and the pear and cherry slug. For the latter pest, arsenate of lead should not be used if the cherries are within a month of ripening. Arsenate of lead is so tenacious, and thus it is likely to remain on the fruit until it is ripe, when it would be dangerous to the consumer. Thus, while this property of remaining on the fruit for a considerable time is of great value in the Codlin Moth spraying, it is quite of the opposite value when used for the pear and cherry slug. Either tobacco water or hellebore is useful for the eradication of this pest, as these substances do not remain long on the trees, and they are quite as effective as arsenate of lead.

Codlin moth spraying, too, will be in evidence this month. Owing to the early season, it is possible that the development of the moth will take place earlier. It is generally assumed that the appearance of the moth is coincident with the bursting of the flowers. This is not always so—the moths frequently come slightly later than the blooming period. Owing to the rapid expansion of the fruit, it is well to follow the first spraying with a second in a week or ten days' time. Arsenate of lead is still the spray for the Codlin moth, nothing having been found to supersede it.

The Vegetable Garden.

A good tilth, and a well-pulverized soil, are the main soil necessities in the vegetable garden this month. Frequent cultivations will keep in the soil moisture, and will obviate the necessity for surface waterings. At the same time, it should be remembered that the vegetable garden requires more water than the flower garden, owing to the quick growth of the plants. Quickly-grown vegetables are more tender and more luscious than slowly-grown ones: thus a good water supply will need to be maintained. Weeds are great moisture-robbers, and they should be kept out of the vegetable garden at this time of the year.

Late plantings of tomatoes may now be carried out; all early-planted plants should be fed, staked, and the laterals pinched back. A little bone-dust or superphosphate may be given, but these are not equal to animal manures, if the latter are available. Chemical manures should only be given in limited quantities, 6 or 7 cwt. per acre would be a heavy dressing, and this works out at nearly 3 ozs. per square yard. Vegetable growers may easily try this for themselves, and it will soon be seen that 3 ozs. scattered over a square yard of surface will appear to be a very light dressing.

French beans, carrot, parsnip, celery, radish, peas, and turnip seeds may now be sown. Seeds of cucumber, melon, and pumpkin family may now be sown in the open ground. All seedlings may be transplanted on favorable days, and it will be well to sprinkle the tops as well as to water the roots.

Asparagus beds may be top-dressed with manure, and kept well weeded. Such weak growths that are not gathered for eating should be cut out of the beds.

Celery trenches will require attention at this time of the year; and to insure good, quick growth, frequent waterings will be necessary.

The Flower Garden.

Flower gardens are troubled with many pests at this time of the year. Rose aphis is one of the most prevalent; frequent applications of tobacco water will keep this pest in check. The hot winds should not be waited for so as to rid the garden of the pests, because a great deal of damage is done before the hot winds come. They should be sprayed in any case.

Rose mildew will also need combating. This may be done by dusting the bushes with sulphur while they are wet with the morning dew. The ground may also be sprinkled, as the fumes check the fungus.

Leaf-rolling or leaf-eating insects will need to be sprayed with arsenate of lead or Paris green.

The surface should be kept well hoed so as to conserve the moisture, especially after the frequent waterings that should be given.

Dahlia and chrysanthemums may be planted in soil that has been dug over two or three times, and each time digging in manure. The soil must not be too rich, but must be well drained.

Bulbs that have lost their foliage may be lifted, but do not cut the foliage, as this means loss of sap and energy.

Asters, zinnias, salvias, balsams, amaranthus, celosias, &c., lobelia, bedding begonia, iresines, alternantheras, &c., may now be planted out for summer and autumn flowers.

EFFECT OF SULPHATE ON CROPS.

Certain plants, says the *Pharmaceutical Journal*, seem to be benefited by treatment with sulphates, but others show less response to sulphates than to phosphates. Plants belonging to cruciferæ and leguminosæ are most favorably affected by treatment with calcium sulphate, although the latter appears to stimulate seed production in cereals such as barley and oats but have little or no effect on straw. In the case of clover the increase in the air-dry material due to calcium sulphate (gypsum) was 23 per cent. while with rape calcium sulphate mixed with a complete fertilizer gave a crop 17 per cent. heavier than with complete fertilizer alone; with radishes the increase in the crop under the same conditions was 9 per cent. The root development of red clover and rape showed a marked increase under the influence of the calcium sulphate dressing.

Free sulphur is harmful even in larger supplies of calcium carbonate. —Extract *Journal Industrial and Engineering Chemistry*, May, 1916.

REMINDERS FOR NOVEMBER.

LIVE STOCK.

Horses.—Continue to feed stable horses well; add a ration of greenstuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old and badly-conditioned horses liberally. If too fat, mares due to foal should be put on poorer pasture. Turn out workers due for a spell at grass. In

view of sand trouble this year horses which have been paddocked all the winter should not be put to work until properly conditioned and any sand accumulation got rid of. A course of three or four bran mashes, after a twelve hours' fast, followed by 1 to 1½ pints of linseed oil, is helpful. Repeat in two or three days, if necessary. Colts to be gelded should be operated on before hot weather sets in.

Cattle.—Except on rare occasions, rugs may now be used on cows on cold and wet nights only. Continue giving hay or straw. Beware of milk fever. Read up method of treatment in *Year-Book of Agriculture*, 1905. Have cows' milk weighed and tested for butter fat. Rear heifer calves from cows giving satisfactory results. Give calves a warm dry shed and a good grass run. Keep calves' premises scrupulously clean and regularly disinfected with Phenyle or floors sprinkled with quicklime. Feeding vessels must be kept clean. Skim milk should be scalded, unless it is known that the cows are healthy. Give the calves a *regular quantity*, and *do not overfeed*. Better too little than too much. Give milk at blood heat. Dehorn all calves, except those required for stud or show purposes.

Pigs.—Supply plenty of bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Read articles on breeding and feeding and housing in *Journals, April, 1912, June, 1913, and May, 1915.*

Sheep.—Prepare for dipping. Ascertain exact contents of bath before mixing. Powder or paste dips have the most lasting effect, particularly where the lice have been bad. Hold sheep in the bath not less than half a minute: if badly infested, longer. Submerge heads twice, but allow them to rise quickly—*most deaths after dipping are due to gross carelessness in holding sheep under too long*, the dip wash being taken in on to the lungs. Dip rams, full grown sheep first, while bath is full, lambs last. Yard sheep over night. Dip while empty, and avoid excessive fouling the drainer. Commence early in the day, and allow sheep to dry before nightfall. Avoid travelling long distances to and from baths, and *dipping sheep while overheated. Do not roughly throw sheep in. Avoid filthy* baths: this increases a dead tip in hot areas.

When constructing new dips, remember moderate-sized ones are most economical, just as efficient, and can be more easily emptied as they become fouled, and if they are near water can be quickly filled.

Poultry.—Provide plenty of green food and shade. Watch for vermin; spray crevices of perches and houses with crude carbolic acid, 1 in 50. Keep water clean and cool, and out of the sun. One packet of Epsom salts should be given to thirty birds through the mash. Remove all male birds from the flock. Infertile eggs are preferable when pickling, or when placed in cool storage.

CULTIVATION.

Farm.—Plant main crop of potatoes. Cut hay and silage. Weed early potatoes. Sow maize and millets. Weed tobacco beds, and water, if dry.

Orchard.—Ploughing, harrowing, and cultivating to be continued. Weeds to be kept down. Secure, pinch, and spray grafts with water. Spray frequently for codlin moth, pear and cherry slug, and peach aphis. Plant out citrus trees.

Vegetable Garden.—Hoe and mulch surface. Suppress weeds. Water where dry and hoe afterwards. Disbud and pinch back tomato plants. Sow celery, French beans, peas, lettuce, cucumber, melon, &c., seeds.

Flower Garden.—Water and mulch. Cultivate and keep down weeds. Thin out weak wood from roses. Prune early all flowering shrubs that have finished flowering. Lift and store bulbs. Plant out dahlias and chrysanthemums. Liquid-manure herbaceous perennials.

Vineyard.—Field grafts require careful attention in the way of removal of suckers and scion roots. Cultural work, such as scarifying and hoeing, should be actively pushed forward, so as to provide as good a "mulch" as possible during summer. Proceed with tying up, stopping and topping. Avoid excessive topping, summer pruning being usually more injurious than useful in warm, dry climates. Cincture Zante currant vines after flower caps have fallen. Apply second sulphuring just before blossoming, wherever Oidium was prevalent last year.

Cellar.—Same as last month.

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MILLING AND BAKING TESTS OF VICTORIAN WHEAT.

By P. R. Scott and F. G. B. Winslow.

Introductory.

Since the establishment of the experimental mill and baking oven, several articles have appeared in former issues of this *Journal* dealing with the milling and baking qualities of Victorian wheats, grown on the experimental farms at Longerenong, Werribee, and Rutherglen. This work was started with the object of assisting the farmer in some practical manner in growing the varieties best adapted to this State, which are not only high yielding varieties, but possess the best chemical, milling, and baking characteristics. At present the variety mostly in favour with the farmer is the one that will fill the greatest number of bags per acre; with the miller, the sample that will return the greatest number of bags of flour per ton; with the baker, the flour that will return the greatest number of loaves per sack. The present article is a continuation of this work. During the past year nineteen varieties of named wheats and a number of unnamed crossbreds have been taken for the test.

A new departure was made in the process of manipulating the wheat before milling; formerly the sample was conditioned straightway, and consequently the flour in some cases was found to suffer in appearance. By means of a specially-designed apparatus for cleaning the wheat, it was possible to conform more closely to the treatment given to the wheat in a large mill. The effect of this treatment is strikingly illustrated in the difference between the bushel weight of this season's f.a.q. sample before and after cleaning. The cleansed wheat shows an advantage of 4 lbs. per bushel over the uncleaned sample. In addition, the flour from the cleaned wheat has a better appearance, owing to the elimination of the particles of dust, &c., which formerly found their way into it

13314.

Longerenong.

The following table gives a summary of the tests made on fourteen commonly grown varieties, and six of the most promising of the unnamed *crossbreds which were grown at Longerenong*:—

TABLE 1.

RESULTS OF MILLING TEST ON WHEAT GROWN AT LONGERENONG. SEASON 1915-16.

Variety.	Yield per Acre.	Bushels Weight.	*Crude Protein in Wheat.*	Flour Yield.	Strength, Water Absorption Capacity.	Gluten.		Crude Protein in Flour.	Colour, 20 points max.	Moisture in Wheat.	Moisture in Flour.
						Wet.	Dry.				
	bh. lb.	lb. oz.	per cent.	per cent.	qts.	per cent.	per cent.	per cent.		per cent.	per cent.
American 8	40 30	68 7	12·75	74·2	50·0	30·70	10·52	11·18	19·5	10·84	13·11
Bayah	40 15	67 6	13·00	71·5	52·4	27·08	11·25	11·25	15·5	11·16	12·96
Bunyip	32 15	66 2	13·62	75·0	52·8	32·31	11·56	11·87	18·5	11·40	13·04
Selected Bunyip ..	..	65 4	13·31	68·5	49·8	32·60	11·13	11·99	18·5	11·47	13·13
College Eclipse ..	42 45	68 1	12·69	72·5	53·8	33·56	11·67	11·68	19·0	10·75	13·02
Cerrawa	42 30	66 8	12·69	73·2	49·8	25·70	8·75	11·44	18·5	11·18	13·01
Dart's Imperial ..	45 55	67 6	12·24	72·7	50·0	27·05	8·23	11·50	18·5	10·99	13·60
Selected Federation	54 32	67 3	10·25	72·7	47·8	28·17	7·26	9·25	18·0	11·16	13·70
Bulk Federation ..	52 30	67 0	10·99	72·5	47·6	24·91	7·72	9·87	17·5	11·31	13·30
Gluyas	45 5	66 5	11·25	75·0	51·2	27·82	8·72	10·50	18·5	10·84	13·40
Huguenot	30 2	63 3	15·93	78·0	57·6	48·45	15·25	14·93	3·0	10·04	15·10
King's Early ..	34 30	67 4	13·37	71·0	51·0	32·80	11·45	12·69	17·5	10·85	13·30
Major	54 25	67 1	11·25	71·9	51·0	27·87	9·38	10·37	18·5	11·27	13·64
Marshall's No. 3 ..	54 52	67 4	10·74	74·0	50·6	25·67	9·06	10·12	18·0	11·32	13·47
Viking	39 52	66 8	10·99	73·4	51·6	28·68	9·24	10·37	19·5	11·10	13·60
Yandilla King ..	54 27	66 8	11·05	76·0	52·4	29·00	9·72	10·50	18·5	11·66	13·27
CROSSBREDS.											
Bobs × *Federation* ..	*40 33*	*67 4*	*10·87*	*72·0*	*52·0*	23·98	8·40	9·49	*17·0*	*11·61*	*13·44*
Indian F × Federation	44 30	67 6	11·93	73·0	53·4	28·33	10·35	10·99	19·5	10·83	12·93
Indian F × Federation	28 47	67 3	10·37	72·7	52·6	25·23	8·77	9·43	19·5	10·80	13·20
Stanley × Yandilla King	42 21	66 3	10·74	74·9	50·6	27·40	9·27	10·50	19·0	11·09	13·20
Indian F × Comeback	*58 0*	*67 4*	*10·12*	*73·7*	*52·0*	23·97	8·35	9·62	*18·0*	*11·49*	*13·80*
Thew × Comeback	41 22	67 9	12·12	73·9	52·6	32·60	10·14	11·37	18·0	10·84	12·40

The average quality of the wheats grown at Longerenong is highly satisfactory. Where variations are noted they are not so marked as in former tests. The main points observed are—the bushel weight, percentage of flour, water absorption capacity, and the gluten content.

The bushel weight was, on the average, high, ranging from American 8, 68 lbs. 7 oz., to Huguenot, 63 lbs. 3 oz. The yield of flour ranged from Huguenot, 78 per cent., to King's Early, 71 per cent., exclusive of selected Bunyip, which gave an indifferent yield. The water absorption capacity is usually the most variable. Huguenot, as was to be expected, shows the highest figure. College Eclipse is also worthy of mention, taking 53.8 quarts per sack. This may be considered as a fairly high quantity, and would indicate in some measure that this wheat is well suited to the district. Federation, with 47.6 quarts per sack, shows the lowest test of all varieties grown at this farm. The difference of over 6 quarts of water per sack of flour would favour College Eclipse in

the eyes of the baker. The highest content of gluten was held by College Eclipse, 11.67 per cent., and the lowest by Federation, 7.26 per cent. All the flours milled were of a good colour, with the exception of Huguenot. The general average of the wheats in all respects was higher than this year's f.a.q. sample. Among so many wheats showing such good results at Longerenong, it is difficult to mark out any worthy of special notice. The following, in order of merit for quality, may be mentioned.—College Eclipse, Bunyip, Bayah, American 8, King's Early, and Yandilla King.

The six unnamed crossbreds all gave satisfactory returns, and seem worthy of further trial. Mention may be made of Indian F x Federation and Thew x Comeback as being high in gluten, returning a good percentage of flour and bushel weight. Indian F x Comeback returned about 4 bushels per acre more than Federation.

Werribee.

Sixteen named varieties and thirteen unnamed crossbreds constituted the lot tested from the wheats grown at the Werribee Research Farm.

TABLE 11.

RESULTS OF MILLING TESTS ON WHEATS GROWN AT WERRIBEE.

Variety.	Yield of Variety in Field Plots.		Bushel Weight of Clean Wheat.		Protein Content in Wheat.	Flour Yield.	Strength, Water Absorption Capacity.	Gluten. Wet.	Gluten. Dry.	Nitrogen Content.	Crude Protein in Flour.	Colour, 20 points max.	Moisture in Wheat.	Moisture in Flour.
	bh.	lb.	lb.	oz.	per cent.	per cent.	qts.	per cent.	per cent.	per cent.	per cent.		per cent.	per cent.
ollege Eclipse ..	23	6	67	4	9·87	72·5	52·0	29·24	9·57	1·50	9·37	15·5	11·97	13·02
omeback	17	30	67	1	11·31	71·2	55·2	28·67	10·78	1·71	10·68	16·0	12·34	13·30
ommonwealth ..	23	12	64	4	9·06	69·0	45·2	22·55	8·21	1·36	8·50	15·5	12·04	13·09
arrawa	20	24	66	2	10·68	68·5	48·5	25·16	8·49	1·59	9·94	15·5	12·48	12·9
art's Imperial ..	20	6	65	7	8·12	71·0	50·0	23·50	8·34	1·30	8·12	15·5	12·65	13·13
ederation	26	0	65	5	9·12	69·5	46·2	20·29	7·47	1·34	8·38	15·5	12·58	13·10
luyas	20	6	66	5	10·00	72·7	50·4	25·25	8·77	1·52	9·49	16·0	12·64	13·2
uguenot	11	36	63	1	17·05	74·8	58·2	54·20	15·91	2·73	17·07	2·0	12·20	13·5
ing's Early ..	24	54	66	5	10·93	70·0	48·4	32·80	10·74	1·63	10·18	16·5	12·56	12·7
ac's White ..	15	12	64	1	9·49	71·8	50·0	33·77	7·49	1·39	8·69	16·0	12·51	13·3
lajor	24	24	66	0	8·81	72·9	46·2	26·00	7·01	1·40	8·75	15·5	12·49	13·1
arshall's No. 3 ..	20	42	65	4	12·06	71·0	48·0	25·29	7·95	1·82	11·37	15·0	11·99	13·03
enny	25	18	64	6	8·75	72·9	48·8	19·41	6·99	1·31	8·19	16·5	12·01	13·02
'arden	19	6	66	5	10·50	74·2	47·6	25·67	10·29	1·55	9·68	16·0	11·91	11·04
andilla King ..	24	54	66	2	9·19	75·0	49·0	29·25	9·51	1·38	8·63	15·5	12·00	13·01
ealand Blue ..	8	12	66	5	10·50	74·5	49·2	23·78	7·60	1·54	9·62	15·5	11·60	12·71
rossbred, 78A ..	23	42	65	5	12·12	71·2	50·2	29·39	9·89	1·79	11·18	16·0	12·30	12·96
.. 265 ..	22	48	63	9	11·37	68·1	48·8	32·67	10·20	1·73	10·81	16·0	12·21	12·30
.. 298 ..	17	54	61	3	14·00	71·7	48·4	38·78	12·84	2·14	13·37	17·5	12·39	13·3
.. 304 ..	19	24	62	6	12·69	70·9	52·0	31·37	11·05	1·87	11·68	16·0	12·41	13·2
.. 4050 ..	23	6	63	9	10·99	75·0	59·2	28·81	8·35	1·58	9·87	16·0	12·51	13·1
. 4056 ..	18	24	64	6	11·05	69·0	56·0	33·10	10·68	1·59	9·94	18·5	12·02	13·1
.. 4059 ..	23	30	65	5	9·81	72·5	49·4	23·96	7·82	1·34	8·38	15·0	12·78	13·4
.. 4071 ..	30	80	66	3	8·87	70·5	47·4	20·91	7·20	1·20	7·50	15·0	12·52	13·4
.. 4101 ..	21	24	61	3	8·30	74·7	56·4	18·94	6·43	1·20	7·50	20·0	12·46	12·8
.. 4102 ..	20	6	63	6	10·99	74·0	62·0	32·30	9·67	1·62	10·12	7·0	12·29	12·94
.. 4106 ..	21	0	64	1	10·12	69·2	50·6	25·50	8·74	1·45	9·06	17·5	12·10	13·1
.. 4108 ..	23	6	64	7	7·56	68·1	50·6	22·00	6·96	1·21	7·56	17·5	12·25	13·1
.. 4109 ..	22	18	64	6	7·43	71·2	47·6	17·56	5·82	1·19	7·44	14·5	12·39	13·2

The average quality and bushel weight of the wheats from Werribee were lower than from Longerenong. The yield of flour varied from Yandilla King, 75 per cent., to Currawa, 68.5 per cent. Three varieties gave under 70 per cent. (Commonwealth, Currawa, and Federation). The water absorption capacity varied between Comeback, 55.2 quarts, and Commonwealth, 45.2 quarts. College Eclipse shows a good strength and high yield. The gluten content varied between Comeback, 10.78 per cent., to Penny, 6.99 per cent. The colour of the flours was indifferent. The following may be mentioned as showing the best quality on this farm:—Warden, Yandilla King, College Eclipse, Comeback, Gluyas and Zealand Blue. Among the crossbreds special mention may be drawn to Nos. 4102 and 4050. No. 4102 is remarkable for its high water absorption capacity, and No. 4050 for a high flour yield and water absorption capacity

Rutherglen.

Twelve named varieties and ten unnamed crossbreds comprise the number tested from Rutherglen Experimental Farm.

TABLE III.

RESULTS OF MILLING TESTS ON WHEATS GROWN AT RUTHERGLEN.

Variety.	Yield of Variety in Field Plots.	Bushel Weight of Harvested Sample.	Protein Content in Wheat.	Flour Yield.	Strength, Water Absorption Capacity.	Gluten. Wet.	Gluten. Dry.	Nitrogen Content.	Crude Protein in Flour.	Colour, 20 points max.	Moisture in Wheat.	Moisture in Flour.
	bh. lb.	lb. oz.	per cent.	per cent.	qts.	per cent.	per cent.	per cent.	per cent.		per cent.	per cent.
American 8 ..	15 40	67 1	10·81	70·9	48·2	21·4	8·2	1·57	9·81	18·0	9·6	11·08
College Eclipse ..	*18 40*	*65 9*	*10·93*	*74·0*	*47·6*	*25·3*	*9·81*	*1·57*	*9·81*	*18·5*	*9·1*	*11·04*
Commonwealth ..	15 20	64 7	8·62	71·6	46·0	18·0	6·5	1·26	7·94	15·0	9·7	11·11
Currawa	21 20	65 5	10·93	68·5	47·2	19·6	7·0	1·56	9·74	18·0	9·6	10·85
Dart's Imperial ..	*15 20*	*64 1*	*10·50*	*72·4*	*46·2*	*21·0*	*7·3*	*1·52*	*9·49*	*18·0*	*9·2*	*12·95*
Federation	21 40	65 2	9·31	73·7	49·4	22·1	7·3	1·37	8·56	17·5	8·6	10·28
Gluyas	17 40	64 6	9·55	72·2	49·2	18·8	7·5	1·40	8·75	19·5	9·2	11·39
King's Early ..	20 0	64 6	10·31	73·1	48·4	24·2	8·5	1·51	9·43	15·5	9·0	10·41
Marshall's No. 3 ..	18 40	65 1	9·62	74·4	48·0	18·7	7·2	1·44	9·00	18·0	9·2	11·23
Penny	22 20	62 2	10·37	73·9	49·4	20·2	7·5	1·47	9·19	15·5	9·5	11·74
Viking	16 20	64 6	8·62	70·3	46·2	18·7	6·8	1·27	8·00	15·5	10·2	12·48
Yandilla King ..	15 40	64 1	9·49	75·5	50·2	18·8	7·7	1·40	8·75	15·5	9·3	11·64
Crossbred 1 ..	..	68 1	9·81	75·5	51·0	20·8	7·6	1·44	9·00	18·5	8·9	11·43
,, 2 ..	..	68 1	10·12	75·3	51·0	20·2	7·4	1·47	9·19	18·0	9·5	11·92
,, 3 ..	..	67 8	9·31	73·9	48·6	19·6	7·2	1·38	8·62	17·0	8·8	11·97
,, 4006 ..	..	64 1	11·25	71·5	50·2	24·9	9·0	1·62	10·12	16·5	9·2	11·60
,, 4049 ..	..	64 7	9·49	70·5	49·2	19·6	6·9	1·45	9·06	16·5	8·8	11·63
,, *4051* ..	..	*64 7*	*9·62*	*80·0*	*63·4*	*24·3*	*8·6*	*1·45*	*9·06*	*3·0*	*8·6*	*11·60*
,, 4056 ..	..	66 8	10·12	71·0	58·4	28·1	9·0	1·54	9·62	19·0	8·3	11·90
,, 4061 ..	..	66 2	11·87	73·7	53·0	26·8	8·7	1·80	11·25	17·5	8·8	11·55
,, *4069* ..	..	*65 5*	*9·00*	*72·7*	*50·8*	*20·5*	*6·8*	*1·35*	*8·44*	*17·5*	*8·5*	*11·30*
,, 4078 ..	..	65 7	11·44	73·2	49·4	32·5	11·0	1·76	10·99	20·0	8·5	11·42
Victorian f.a q. ..	..	clean 65 7; dirty 61 5	10·06	70·6	49·0	23·2	8·0	1·50	9·37	15·5	..	12·60

The dirty bushel weight is that of the original f.a.q. wheat.

The quality of the wheat from this district is poor compared with tests of previous years. The bushel weight is fairly high. The flour yield varied from Yandilla King, 75.5 per cent., to Viking, 70.3 per cent. Currawa, however, yielded only 68.5 per cent. The water absorption capacity varied from Yandilla King, 50.2 quarts, to Commonwealth, 46.0 quarts. The gluten content ranged from College Eclipse, 9.81 per cent., to Currawa, 7.0 per cent. The colour of the flour was, on the average, better than that from the Werribee wheats, but inferior to that from Longerenong. Among the crossbred wheats some exceptional ones may be picked out. No. 4051 returned 80 per cent. of flour of high strength. No. 4056 also gave a good flour yield of high strength. No. 4078 shows evidence of a good all-round quality. The following varieties may be considered as showing the best results at this farm:—College Eclipse, King's Early, American 8.

Yield and its Relation to Rainfall.

The yield per acre and its relation to the rainfall during the growing season will now be considered. This will be shown in Tables IV. and V. by comparing the results obtained from eight named varieties which were grown in each district. The varieties were—

Gluyas and King's Early—early varieties.

Dart's Imperial and Federation—mid-season varieties.

College Eclipse, Currawa, Marshall's No. 3, and Yandilla King—late varieties.

Table IV.

Rainfall During the Growing Season 1915.

	Longerenong.	Werribee.	Rutherglen.
	Points.	Points.	Points.
June	127	156	349
July	380	157	361
August	156	139	198
September	238	166	291
October	409	191	237
November	90	62	287
Total	14·00 inches	8·71 inches	17·17 inches

Table V.

Yield per Acre of Wheats.

	Longerenong.	Werribee.	Rutherglen.
	Bushels per acre.	Bushels per acre.	Bushels per acre.
College Eclipse	42·45	23·6	18·40
Currawa	42·30	20·24	21·20
Dart's Imperial	45·55	20·6	15·20
Federation	54·32	26·0	21·40
Gluyas	45·5	20·6	17·40
King's Early	34·3	24·54	20·0
Marshall's No. 3	54·52	20·42	18·40
Yandilla King	54·27	24·54	15·40

Although the most rain fell at Rutherglen during the growing season, the yield from this farm was the lowest per acre. At Rutherglen

the winter proved to be the wettest on record, no less than 17.17 inches falling during the growing period. The flat land on which the experimental plots were situated was water-logged, with the result that the yield was greatly reduced.

The variation in composition due to differing soils and climatic conditions is here shown:—

TABLE VI.

—	Bushel Weight.	Crude Protein in Wheat.	Flour.	Water Absorption Capacity.	Gluten.		Crude Protein in Flour.	Moisture	
					Wet.	Dry.		In Wheat.	In *Flour.*
	lbs. oz.	%	%	quarts.	%	%	%	%	%
Longerenong	67 3	11·88	73·40	50·8	28·30	9·41	11·04	11·10	13·30
Werribee ..	66 2	9·99	72·5	49·06	26·34	8·85	9·43	12·36	13·01
Rutherglen	64 9	10·02	72·97	48·25	21·06	7·79	9·31	9·16	11·32

A general decline in quality may be noted in the composition of the average sample of the wheats grown at these farms. Wheats grown at Longerenong, generally speaking, are superior in quality to those grown at Werribee and Rutherglen.

Table VI. offers a comparison between the variation in general composition of a number of wheats grown in different districts during the past year. Table VII. compares the protein content of a number of named varieties grown at Longerenong and Rutherglen during the past four years.

TABLE VII

—	Crude Protein Content of Wheats grown at—							
	Longerenong.				Rutherglen.			
	1912.	1913.	1914.	1915.	1912.	1913.	1914.	1915.
	%	%	%	%	%	%	%	%
American 8	12·56	13·69	14·06	12·75	12·50	12·31	..	10·81
Dart's Imperial ..	10·62	11·21	12·18	12·24	12·94	13·62	..	10·05
Federation	11·62	9·19	12·62	10·99	11·62	11·31	14·93	9·31
Gluyas	11·37	10·94	13·18	11·25	11·44	12·06	..	9·55
King's Early	14·00	12·25	14·74	13·37	13·81	12·69	..	10·31
Marshall's No. 3 ..	10·31	10·75	..	10·74	11·56	12·06	..	9·62

PROLIFICACY IN ITS RELATION TO STRENGTH.

The wheats most popular with the grower include those noted as being good yielding varieties, the question as to whether they are strong or weak being a secondary consideration. The strength of a flour is measured by its water absorption capacity. The two characteristics, viz., prolificacy and strength, are not usually found associated in any one variety. The commonly grown varieties in this State all belong to the soft wheats, very few of which are noted for high strength. Considerable variations occur in this characteristic, but, as a rule, we find

high strength and low yielding power associated in the one wheat. A typical high-strength wheat, Comeback, does not fill the sacks, and is, in consequence, not a popular variety with the grower, but would be readily bought by the miller. One variety, College Eclipse, at Longerenong and Werribee showed the highest strength of the eight varieties named, see Table V. The yield at each farm was midway between the highest and the lowest. The popular variety, Federation, on the other hand, shows at these farms the best yield and the lowest strength.

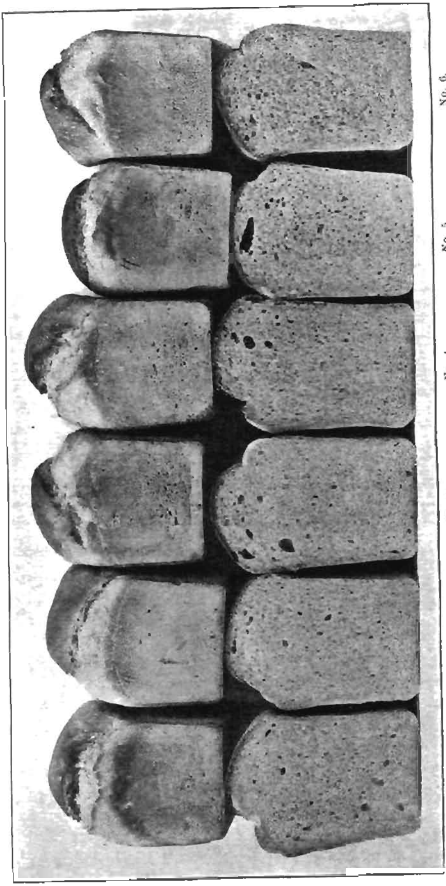
TABLE VIII.

RESULTS OF BAKING TESTS ON WHEAT FROM LONGERENONG.

Variety.	Colour, 20 points max.	Texture, 20 points max.	Weight, grains.	Volume, c.c.	Water used in Doughing c.c.	Points for General Appearance.	Remarks.
American 8 ..	18	19	478	1,445	212	19	Rose very well in oven, fair crust and appearance
Bayah	20	20	494	1,550	222	20	Rose very well in oven, very good crust and appearance
Bunyip	20	20	495	1,620	224	20	Very fair rise in oven, very good crust and appearance
Bunyip (Selected) ..	19	19	485	1,550	211	18	Very good rise in oven, very good crust and appearance
College Eclipse ..	19	19	502	1,345	228	16	Slight rise in oven, fair crust
Currawa	20	19	494	1,620	211	20	Rose very well in oven, very good crust and appearance
Dart's Imperial ..	19	18	487	1,470	212	20	Very fair rise in oven, very good crust and appearance
Federation (Selected)	18	18·5	479	1,520	203	20	Very good rise in oven, good crust, slightly foxy appearance
Federation (Bulk) ..	19·5	20	476	1,705	202	20	Rose very well in oven, excellent crust and appearance
Gluyas	19	19·3	489	1,510	217	20	Rose very well in oven, excellent crust and appearance
Huguenot	17	17	525	1,345	245	15	Fair rise in oven, very long fermentation, sugary appearance of loaf
King's Early ..	20	20	483	1,485	214	20	Very fair rise in oven, very good crust
Major	19	17	488	1,490	216	18	Very fair rise in oven, fair crust and appearance
Marshall's No. 3 ..	18	18	486	1,460	215	18	Very fair rise in oven, fair crust and appearance
Viking	18	17	494	1,455	219	20	Very fair rise in oven, very good crust and appearance
Yandilla King ..	20	17	494	1,445	222	18	Slight rise in oven, very good crust and appearance
Bobs × Federation A	19	19	490	1,550	221	19	Very good rise, good crust and appearance
Indian F × Federation B	16	18	496	1,500	228	20	Very good rise, good crust and appearance
Indian F × Federation C	16	18	493	1,505	223	20	Very good rise, good crust and appearance
Stanley × Yandilla *King*	18	18	485	1,520	215	18	Very good rise in oven, crust *rough and foxy*
Indian F × Comeback	20	19·5	493	1,500	221	20	Very good rise in oven, crust good
Thew × Comeback ..	19	17	496	1,505	223	19	Very good rise in oven, crust *pale*

BAKING QUALITIES.

Good loaves, as regards general appearance and volume, but lacking in texture and colour, were baked from the flour of the following varieties of wheat grown at Longerenong:—Bayah, Bunyip, Currawa,



No. 1. Federation. No. 2. Crossbred 3. No. 3. Victorian. F.A.Q. No. 4. Crossbred 4049. No. 5. Crossbred 4078. No. 6. Crossbred 4069.

Plate 1.—Loaves Baked from Flours Milled from Four of the New Crossbred Wheat grown at Rutherglen, compared with Loaves Baked from Federation and F.A.Q. Wheats.

Federation, and Gluyas. College Eclipse, although amongst the varieties showing good milling quality, gave disappointing returns on baking. It would, however, be a good wheat for blending with other weaker wheats. The Werribee wheats produced a few flours of good baking quality. The majority of the loaves were lacking in texture and colour, but gave fairly large loaves of good general appearance. The most satisfactory loaves were baked from Commonwealth, Penny, Currawa, and College Eclipse flours.

TABLE IX.

RESULTS OF BAKING TESTS ON WHEAT FROM RUTHERGLEN.

Variety.	Colour, 20 points max.	Texture, 20 points max.	Weight, grains.	Volume, c.c.	Water used in Doughing, c.c.	Points for Appearance, 20 points max.	Remarks.
American 8 ..	15	16	474	1,450	204	18	Proving slow, rose well in oven, very good crust, appearance, and colour
College Eclipse ..	14	14	475	1,445	202	14	Proving slow, rose well in oven, crust inclined to be foxy
Commonwealth ..	18	18	429	1,525	193	14	Proving slow, rose well in oven, crust inclined to be foxy
Currawa	15	17	472	1,545	200	14	Rose well in oven, very good crust and appearance
Dart's Imperial ..	15	15	471	1,500	196	20	Rose well in oven, very good crust and appearance
Federation	17	17	488	1,495	207	19	Rose well in oven, crust slightly foxy
Gluyas	15	15	475	1,550	209	17	Rose fairly well in oven, very good crust
King's Early ..	16	15	475	1,520	203	17	Proving very slow, rose well in oven, crust foxy
Marshall's No. 3 ..	17	19	474	1,445	204	16	Rose well in oven, fair crust, foxy appearance
Penny	16	18	476	1,500	209	16	Rose well in oven, foxy crust
Viking	15	18	472	1,510	196	16	Proving very fast, foxy crust
Yandilla King ..	15	18	478	1,480	213	16	Rose well in oven, crust very good
Crossbred 1 ..	16	18	492	1,400	214	18	Rose well in oven, crust slightly pale
„ 2 ..	16	16	493	1,480	214	18	Rose well in oven, crust very good
„ 3 ..	16	18	477	1,520	206	20	Rose well in oven, crust very good
„ 4006 ..	16	15	498	1,640	213	20	Rose well in oven, crust very good
„ 4049 ..	16	16	490	1,540	209	20	Proving very slow, slight rise in oven, crust had sugary appearance
„ 4051 ..	10	14	528	1,410	264	16	Proving fairly fast, very good rise in oven, very good crust
„ 4056 ..	14	14	504	1,510	248	19	Proving fairly fast, very good rise in oven, very good crust
„ 4061 ..	18	18	486	1,448	222	19	Proving fairly fast, very good rise in oven, very good crust
„ 4069 ..	15	18	484	1,470	216	20	Proving fair, very good rise in oven, good crust and appearance
„ 4078 ..	16	16	487	1,480	209	18	Very fair rise in oven, very good crust and appearance
Victorian f.a.q. Sample	18	20	491	1,555	212	20	Very good rise in oven, very good crust and appearance of loaf

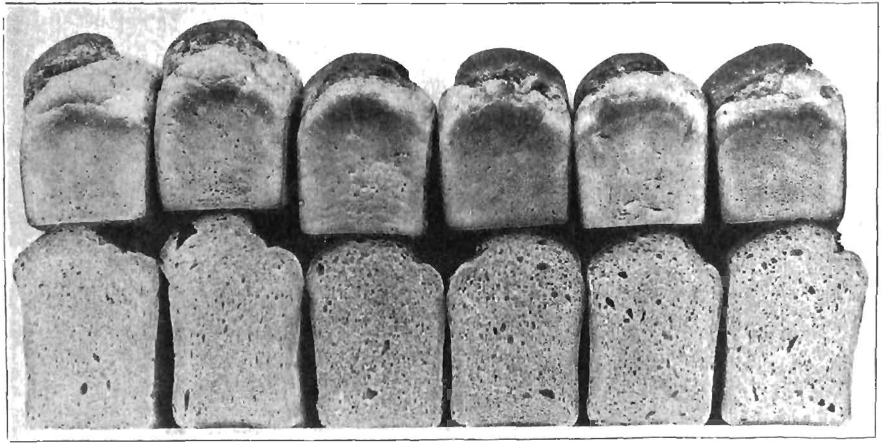
From the Rutherglen wheats, although good volumed loaves were baked, the average loaf was poor in colour, texture, and general appearance. The varieties which gave the best loaves were Commonwealth, Currawa, Dart's Imperial, and Gluyas.

As a blend of two or more flours generally produces a better loaf than a flour of a single variety, a blend was made of the flour from each

Table X.

Results of Baking Tests on Wheat from Werribee.

Variety.	Colour, 20 points max.	Texture, 20 points max.	*Weight, grains.*	*Volume, c. c.*	Water used in Doughing, c. c.	Points for Appearance, 20 points max.	Remarks.
College Eclipse ..	16	15	496	1,520	221	20	Rose very well in oven, very good crust and appearance
Comeback	20	18	499	1,500	234	20	Rose very well in oven, very good crust and appearance
Commonwealth ..	16	15	473	1,610	192	20	Rose very well in oven, very good crust and appearance
Currawa	16	15	490	1,490	205	20	Rose very well in oven, very good crust and appearance
Dart's Imperial ..	14	14	485	1,500	212	18	Very fair rise in oven, foxy appearance of crust
Federation	17	17	474	1,410	196	18	Fair rise in oven, foxy appearance of crust
Gluyas	16	16	490	1,420	214	18	Fair rise in oven, foxy appearance of crust
Huguenot	7	6	512	1,420	233	10	Overworked in proving, dropped back in oven
King's Early ..	14	14	475	1,335	265	16	Poor rise in oven, fair appearance of loaf
Mac's White ..	16	16	488	1,450	212	18	Fair rise in oven, fair appearance of loaf
Major	17	17	474	1,380	191	18	Fair rise in oven, fair appearance of loaf
Marshall's No. 3 ..	14	14	477	1,440	204	18	Fair rise in oven, fair appearance of loaf
Penny	18	17	484	1,630	207	20	Very good rise in oven, very good appearance of crust
Warden	14	14	480	1,420	202	17	Very fair rise in oven, crust foxy appearance
Yandilla King ..	15	16	484	1,410	206	17	Very fair rise in oven, crust foxy appearance
Zealand Blue ..	17	17	485	1,450	209	17	Very fair rise in oven, crust foxy appearance
Crossbred 78A ..	16	17	489	1,460	213	17	Very fair rise in oven, crust foxy appearance
,, 265 ..	16	14	481	1,390	207	18	Very fair rise in oven, crust foxy appearance
,, 298 ..	17	18	478	1,330	205	15	Slight rise in oven, fair colour and appearance
,, 304 ..	18	17	494	1,490	228	20	Rose fairly well in oven, good crust and appearance
,, 4050 ..	19	17	520	1,465	249	18	Rose well in oven, good crust and appearance, good variety for blending with weak wheats
,, 4056 ..	16	16	501	1,450	233	17	Fair rise in oven, crust inclined to be foxy
,, 4059 ..	16	16	485	1,450	209	19	Fair rise in oven, crust inclined to be foxy
,, 4071 ..	19	17	480	1,480	201	20	Very good rise in oven, very good crust and appearance of loaf
,, 4101 ..	16	16	479	1,300	214	16	Fair rise in oven, crust rough and fiery
,, 4102 ..	16	18	519	1,490	263	17	Rose well in oven, should be an excellent variety for blending with soft weak wheats, excellent flavour
,, 4106 ..	18	18	475	1,410	212	20	Rose well in oven, very good crust and appearance
,, 4108 ..	17	17	476	1,450	215	20	Rose well in oven, very good crust and appearance
,, 4109 ..	16	17	472	1,600	202	17	Rose well in oven, crust foxy
F.A.Q., 1915–1916 ..	18	20	491	1,555	212	20	Very good rise in oven, very good crust and appearance of loaf



No. 1. Varieties, Rutherglen. No. 2. Crossbreds, Rutherglen. No. 3. Varieties, Werribee. No. 4. Crossbreds, Werribee. No. 5. Varieties, Longerenong. No. 6. Crossbreds, Longerenong.

Plate 2.—Loaves Baked from the Blended Flours Milled from Wheats grown at Rutherglen, Werribee, and Longerenong.

variety, and in a similar manner of the crossbreds. The blended flours were afterwards baked with the following results, as shown in Table XI.:—

TABLE XI.

Result of baking test of blends of the varieties and crossbred wheats grown at Rutherglen, Werribee, and Longerenong:—

Variety.	Colour, 20 points max.	Texture, 20 points max.	Weight in Grams.	Volume, c.c.s.	Water used in Doughing, c.c.s.	Points for Appearance, 20 points max.	Remarks.
Rutherglen—							
Varieties ..	18	20	479	1,600	212	20	Very good rise in oven, good crust and appearance
Crossbreds ..	18	20	481	1,620	228	20	.. .. .. ,,
Werribee—							
Varieties ..	19	19	483	1,545	209	20	.. ..
Crossbreds ..	19	19	486	1,560	228	20	.. ..
Longerenong—							
Varieties ..	19	19	485	1,520	230	20	.. ..
Crossbreds ..	19	19	480	1,580	223	20	.. ..

The blends made from the Rutherglen wheats produced the largest volumed loaves, which were of good texture, but were lacking in colour. Another feature of this test was that all the blends gave loaves of better texture and pile than those produced from the single varieties. Further, the crossbred blends gave the best loaves in all respects.

GLUTEN CONTENT.

When making the gluten test on this season's f.a.q. sample of flour we found the recovered gluten was stronger in character than usual. Further, that flour returning strong gluten will bake a more satisfactory loaf if given an increased quantity of yeast food and more work. Another point worthy of special mention is the regulation of the temperature of the dough during the fermentation. After some experimental tests had been made it was found that a temperature of 80° Fahr. gave satisfactory results. The method we recommend as worthy of adoption for present conditions is, briefly, to use more yeast food, and to allow the fermentation of the dough to proceed at a temperature of 80° Fahr. until the dough is on the point of dropping back. When this stage is reached, it should be punched back, allowed to prove for forty minutes longer, punching back every ten minutes during that period, after which the dough may be moulded. The moulded dough should then be allowed a further forty minutes to prove before being baked.

NOTE ON THE POISONING EFFECT OF THE "JOHNSON GRASS," SORGHUM HALEPENSE.

Bulletin of Miscellaneous Information, Royal Botanic Gardens, Kew, England.

Some recent correspondence in the *Indian Forester*, vol. xxxix., Nos. 6 and 10, upon the value of Sorghum halepense, as a fodder grass, and the danger to cattle and horses which its use entails, shows that the exact nature and reactions of the dangerous constituent are not well understood. There is conclusive evidence that the young vegetative parts of S. halepense are, under certain conditions, poisonous to farm animals, and as the plant is, after rice, probably the commonest food and fodder plant in India, besides being much used elsewhere, it has been deemed desirable to publish a short note dealing with the matter.

In 1902 Dunstan and Henry (*Phil. Trans. Roy. Soc.*, A. 199, p. 399) isolated a glucoside, which they called "dhurrin," from the leaves of the great millet (*Sorghum vulgare*). This substance was found to have the empirical formula $C_{14}H_{17}O_7N$, and on hydrolysis with hot dilute hydrochloric acid of the enzyme emulsin, yielded one molecule each of prussic acid, parahydroxybenzaldehyde, and dextrose.

Sorghum halepense, Pers. (*Andropogon halepensis*) is considered by Hackel to be a variety of S. vulgare, Pers. (*Andropogon sorghum*), and there is little doubt that "dhurrin" is found in it as well as in the typical plant. *The free prussic acid is the actual substance which causes* the death of animals eating the young vegetative parts of sorghum.

The enzyme emulsin is present in the parts of the plant containing the glucoside, and when in the early processes of digestion the two come together, the emulsin, by the addition of water to the "dhurrin," breaks the latter down and liberates the poisonous prussic acid.

An examination of the numerous records of cases in which sorghum was used for fodder establishes two facts of practical importance.

Firstly, the young vegetative parts of the plant are the most dangerous to stock, the mature plant being nearly or quite harmless. Analyses of old plants have shown that little or no prussic acid yielding substance was present.

Secondly, the poisonous effect of the grass is enhanced in times of drought. One writer states that the grass is dangerous only in the green state, and that if the same grass is cut and dried and used as fodder, it has no injurious effect. This may be due to the destruction of the glucoside or the emulsin, or both, by the drying of the grass without their coming into contact with each other, but it is possible that the grass was not cut till near maturity—that is to say, after the disappearance of the prussic acid yielding glucoside.

APPLE CULTURE IN VICTORIA.

(*Continued from page 589.*)

By J. Farrell, Orchard Supervisor.

Growth Made by One-year-old and Two-year-old Trees Compared.

It has been previously stated that the planting out of yearling whip-growths is advocated. When planted out at one year old, the tree has the advantage of being allowed to establish its root system early in life, and its development is not impeded by further removal. When the original roots are pruned prior to planting, and the tree cut back to the desired height subsequently, the newly formed root system is able to produce and maintain the three leaders sent up from the crown. But the two-year-old tree, when similarly treated at time of planting, is rarely able to produce and sustain the number of new growths desired for leaders. Whereas, if planted out one year sooner, the tree would have thoroughly established its roots, and, owing to its extended feeding area, the vigorous growths required would be obtained.

Plate 26, Fig. 1, is a John Sharp apple, and a typical yearling of this variety. Fig. 2 is a Prince Alfred, two years old. The latter, when first pruned, was cut into the strong ripe yearling wood. This enabled the leaders to strike off at a nice angle, and is a much better method of forming the head than the one of making it prematurely by cutting the young, soft wood, as explained in connexion with Plate 20, Figs. 2 and 3. Figs. 3 and 4 are same trees, which were grown together in the nursery row, and pruned as shown before being planted out in a fairly rich dark sandy loam. During the period of growth they received similar treatment.

Plate 27 shows the roots and branches made by same trees during the period of growth. The roots and branches of Fig. 1 are strong and well balanced, but the John Sharp usually responds well under fair treatment. Although Fig. 2 made more roots than Fig. 1, it did not produce as much wood on top. Prince Alfred is usually a vigorous grower, and it is probable that if this tree were planted out when one year old it would now have a much more extensive branch system.

Plate 28 illustrates the same trees, the leaders of which are pruned to the buds suitable for the production of the growths desired for next season. In the case of Fig. 1, the side buds are so placed as to permit of the leaders being cut about 6 inches from the crown. While, when Fig. 2 had advanced to the same stage, the buds, at which the cuts are made in order to produce leaders in suitable positions, were not so conveniently placed. This necessitated rather long cutting of the leaders, about 8 inches from their base.

Top-grafted Trees.

A top-grafted tree, as explained in connexion with Plate 17, Fig. 1, consists of a scion of yearling wood of the desired variety, and containing three or four buds, according to the number of main arms, on which it is intended to construct the framework of the tree, grafted on to the stock, about 9 inches from the ground.

In the case of Plate 29, Fig. 1, the scion is Jonathan on a two-year-old Northern Spy stock. The scion originally contained four buds, and

each produced a leader. The uppermost one grew vertical and too strong in proportion to the others, thus forming an objectionable centre.

It was originally intended to start the branch system of this tree on four main arms, but, in order to develop a tree with an open centre and on modern commercial lines, three leaders only are retained, as the removal of the objectionable one became imperative.

Fig. 2 shows the result of this treatment. The leaders retained are not equal in strength, but in this respect greater uniformity could have been maintained had the terminal buds on the stronger growths been treated as explained in connexion with Plate 22.

Plate 30, Fig. 1, is also Jonathan, and worked similarly to the previous

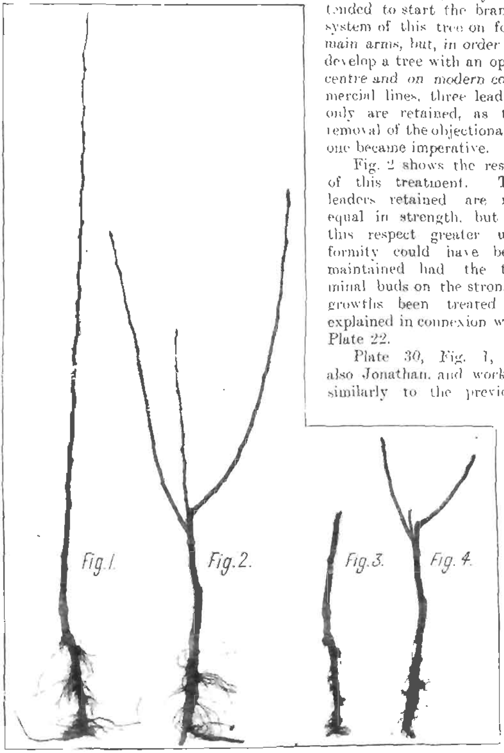


Plate 26.—Roots and Branches of Young Trees Unpruned and Pruned.

tree. But in this case, as occasionally happens when strong stocks are employed, four leaders, of uniform strength and radiating at a suitable angle from the crown, were produced.

Fig. 2 is the same tree pruned. Its four leaders are retained, but they are cut rather long, to side buds, about 8 inches from the crown, on account of suitable ones not having been produced lower down the leaders.

METHOD OF PLANTING.

The trees should be planted out as soon as possible after the planting season commences, in June. It may be observed that when the trees are lifted early from the nursery, and heeled in, they frequently produce

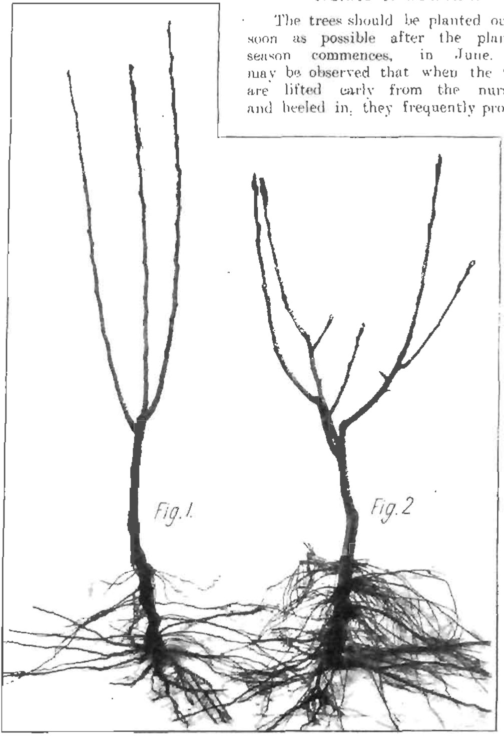


Plate 27.—Same two Trees showing One Year's Growth and Branches.

a number of fibrous roots, which are afterwards destroyed when the trees are being further removed and during transmission to the planter. When early planting is adopted, and the fibrous roots, pro-

duced during the dormant period, allowed to remain intact, the result, other conditions being favorable, will be an early and prolific growth during the following vegetative period. At planting time the roots are cut back, usually from about 4 to 6 inches long. But, when harder pruning is not adopted, all the fibrous roots produced from the nodes on the scion of the stock should be removed, and particularly in the case of the Northern Spy stocks. A stronger and more evenly balanced root system is invariably the result of such treatment.

By employing square stakes to mark out the positions of the trees and to subsequently support them until such time as their roots are

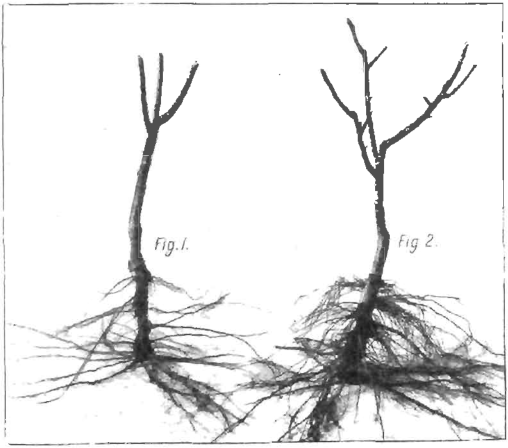


Plate 28.—Same Trees, showing where Leaders should again be Pruned.

thoroughly established, their uprightness and future stability is insured. The trees should be planted close to the stakes, to which they should be firmly tied, as shown in Plate 15, Fig. 1.

Use of the Planting Board.

The use of the planting board is recommended when trees are being planted without stakes to support them and where round pegs are employed to mark their positions. Plate 31 depicts this, which is not only the simplest and quickest means, but also the most accurate method of obtaining straight rows of trees.

Fig. 1 is a view of the planting board, which is 6 feet long and made from 6-in. by 1-in. flooring, with a notch in the centre, and two holes

for iron pegs, each about 18 inches long. The holes should be of sufficient diameter to permit of the pegs passing freely through them when placed as shown in the section, Fig. 2.

To plant the tree, bring the notch in the board against the marking peg, and drive in the iron pegs. Then lift out the board, remove the marking peg, and dig the hole to receive the tree. Next, slip the board over the pegs into its former position. When the tree is placed in the hole it should be held upright, with its stem in the notch of the planting board, and to the same depth at which it grew in the nursery row. When the earth has been carefully

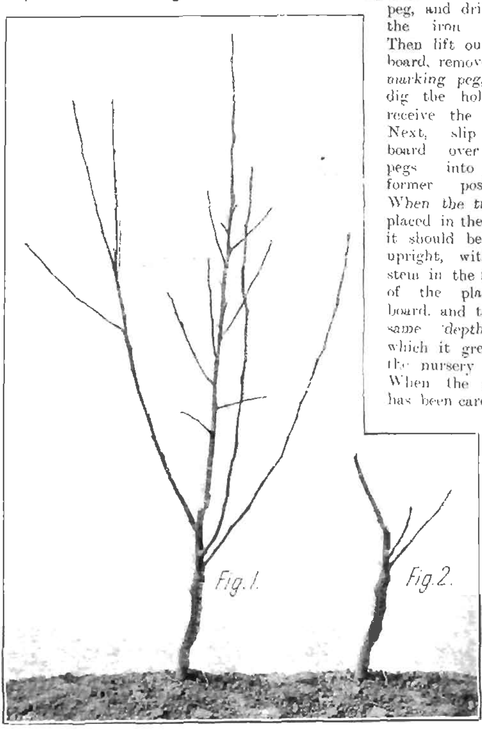


Plate 29.—Jonathan Unpruned and Pruned.

filled in around the roots, press it firmly with the foot to exclude the air and give the tree a firm hold. When this work is carefully executed, the tree occupies the exact position marked out for it by the peg.

In planting small trees the removal of the planting board, to permit of the holes being dug, may be obviated by employing two 2-in. cleats, as shown. By this means the board is raised 2 inches above the surface level, when the holes may be dug and the trees planted without hindrance.

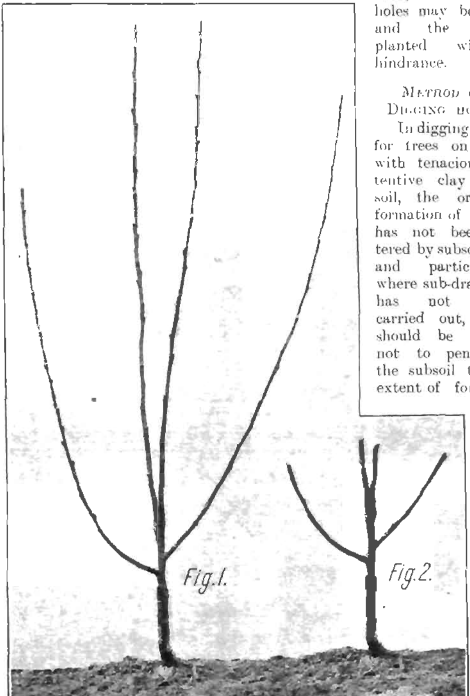


Plate 30.—Jonathan with Four Leaders Unpruned and Pruned.

Method of Digging Holes.

In digging holes for trees on land with tenacious retentive clay subsoil, the original formation of which has not been altered by subsoiling, and particularly where sub-drainage has not been carried out, care should be taken not to penetrate the subsoil to the extent of forming a pan or water catchment, as shown in Plate 32, Fig. 1. When a tree is placed in a hole of this kind, and more especially if it be planted too deep, the surplus water in the soil, as indicated by the arrows, drains into the hole and lodges there, creating unfavorable conditions from which trees frequently suffer and often die.

Fig. 2 shows the correct method of planting. When the roots take up this position in relation to the subsoil, a free passage of the water from the root area to the sub-drains, which should be employed in all orchard land of the class mentioned, is provided.

The evil effects of water lodgment, which causes sourness of the sub-soil in which the lower roots feed, will be more fully dealt with later on, when the necessity for orchard drainage generally, and all the conditions which govern same, are being explained.

When the hole is being excavated, it should be made with sufficient diameter to permit of the roots, if lightly pruned, taking up their natural positions. When the hole is too narrow the roots cannot be properly extended when planting, and a tree started to grow under these conditions cannot thrive as well as when proper planting methods are observed.

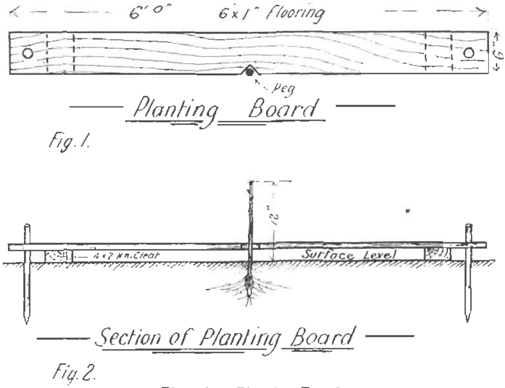


Plate 31.—Planting Board.

Establishing the Branch System.

There is no phase of orchard management that requires more scientific knowledge on the part of the fruit-grower, in order to obtain the best results from his orchard, than the establishment and control of the branch systems of his trees by pruning on modern and commercial lines. Under the ancient method, the variety grown, whether budded or grafted on to the root-grafted stock, layer, sucker, or raised from a seedling, was encouraged when planted out in the orchard to develop into what was known as a standard tree. This was done by permitting the centre growth to run to the vertical, and by the removal of the side-shoots to a height of about 6 feet from the ground. From this point the centre leader continued its upright growth, and, in accordance with Nature's method, it threw out side arms which eventually culminated in a conical

head. Then the apple-grower began to cut the stems about 6 feet from the ground, in order to divide up the centre leader into three or more main arms, which radiated from the crown at an open angle to the vertical. This, in point of time, is recognised as the line of demarcation which separates the ancient method from the commencement of scientific pruning.

The three or more main arms produced on the stem by cutting in the manner described were still further multiplied by subsequent yearly prunings until a head of the requisite dimensions was obtained

The tree, with its increased number of leaders, which constituted a broader framework as a result of this treatment, had also a corresponding increase in the number of lateral growths. These were of a better quality and of higher fruit-bearing capacity than those previously obtainable.

When it was observed that the judicious manipulation of the leaders produced the desired effect, consideration was next given to the fruiting lateral growths. The stronger and less fruitful of these were removed,

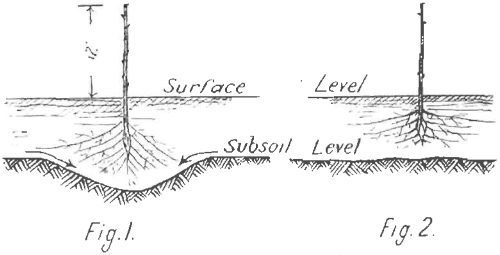


Plate 32.—Digging Holes for Trees.

while the weaker and more fruitful ones were shortened back to encourage the development of stronger blossom buds.

The next step in the advancement of scientific pruning was the gradual shortening of the stem of the standard tree until, during recent years, it has become only about 12 inches high. This is practically regarded as the present-day standard.

Science has so far advanced in regard to modern pruning methods that it has evolved and established set principles under which the leader, lateral, and spur growths of the different varieties may be treated according to their individual needs.

Owing to the application of scientific principles in pruning, supplemented by good cultivation, spraying, &c., fruit-growers are now able to regulate the quantity, size, and quality of their fruit to meet modern requirements, both at home and oversea. And, when given reasonable marketing facilities, they are enabled to make fruit growing a commercial success.

Plate 33 shows a tree of the old English standard type. It is an unnamed seedling, nine years old, and the lowest branch on the stem

is nearly 6 feet from the ground. In the Homeland, generally speaking, apple growing is carried on mostly as an adjunct to mixed farming. The trees, as a rule, are planted in grazing paddocks, and protected until their branches have grown out of the reach of stock. They are *rarely pruned, but, owing to suitable soil and favorable climatic conditions,* heavy crops of good fruit are frequently harvested.

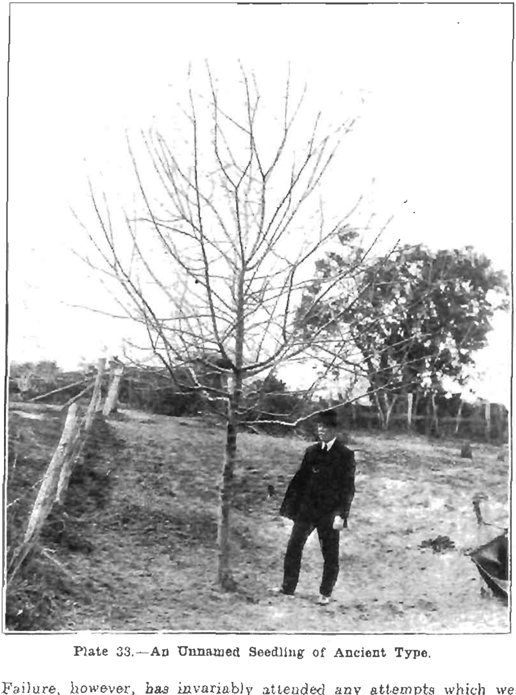


Plate 33.—An Unnamed Seedling of Ancient Type.

Failure, however, has invariably attended any attempts which were made in Victoria to emulate the Old Country methods of apple culture.

Our soils, particularly those in the northern and warmer districts, part too freely with their moisture during dry weather, thus rendering cultivation essential to the growth and maintenance of healthy, vigorous trees, and from those only can we obtain remunerative crops of fruit.

Plate 34 is a Rome Beauty tree of modern design. Its stem is 15 inches high, and the branch system, with its open centre, represents in shape an inverted cone, as compared with the full-centred and conical formation of the ancient type. And when further compared with Plate 33 it will be observed that, in consequence of the hard pruning to which the Rome Beauty was subjected during the first four years of its growth, a circle of leaders was produced, each representing a longitudinal section in the tree's geometrical make-up. This treatment has practically revolutionized the apple tree formation of olden times.

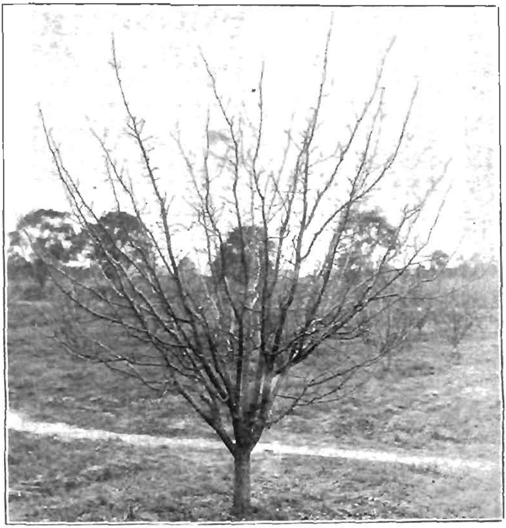


Plate 34.—A Rome Beauty of Modern Design.

The reason for selecting the Rome Beauty to show the comparison is because it is one of those most difficult to shape into the modern type.

The habit of this variety, like the Statesman and others, is to send up strong vertical leaders, particularly when the land is rich or manure applied generously. Many of its leaders produce weak or dormant buds, and they are consequently barren of fruit-producing laterals. This necessitates careful selection and judicious pruning of the leaders in order to secure a sufficient number of short, fruitful laterals. The laterals also require scientific pruning treatment, but this matter will

be more fully detailed later, when the pruning of the Rome Beauty comes under review.

Much has been done in Victoria in the way of experimental pruning, spraying, cultivation, drainage, irrigation, interpollination, &c., but there is no doubt the further application of science to the different phases of the fruit-growing industry would have a stimulating effect, which would assist it to maintain its position as one of our chief national assets.

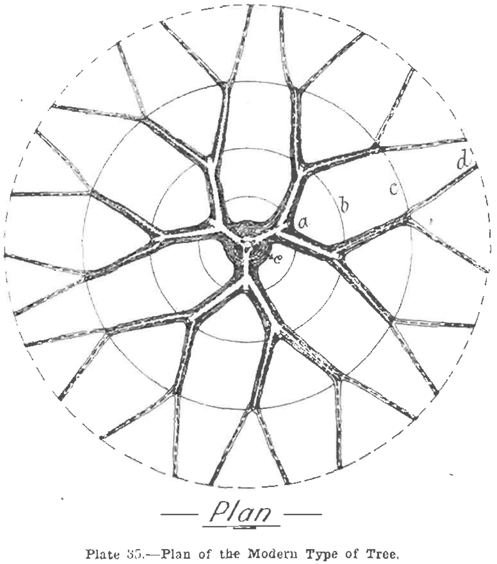


Plate 35.—Plan of the Modern Type of Tree.

Plans of the Branch System.

Plate 35 is plan of the branch system of the modern type of tree as viewed from the vertical. The centre (e) shows where the yearling whip-growth is cut the first year after being planted. The three buds shown send out shoots which, when cut to about 6 inches long the following year at the points inscribed by circle (a), form the main arms on which the branch system is constructed. Straight lines, drawn from point to point of the main arms describing the 120-degree angles within the circle (a), would represent an equilateral triangle.

When the resultant shoots from the (a) cut are pruned again the following year at (b), twelve leaders will be obtained. The number may be increased to twenty-four by cutting at (c) the succeeding year. When the requisite number of leaders are obtained, the (d) cut should be made to an outward or inward bud, according to the angle to the vertical desired. Or the cut may be made to a bud on either side, in order to regulate the leader spacing.

Plate 36 gives side elevation of the tree. One leader is retained to show its angle to the vertical and the lateral growths.

Generally speaking, the angle of 40 degrees from the vertical is a suitable one for the leaders. But it is often the experience of pruners to find great difficulty in producing an open centre when dealing with

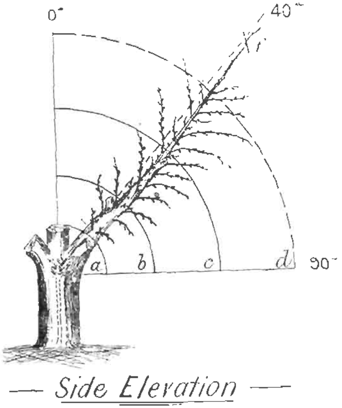


Plate 36.—Side Elevation of Modern Type of Tree.

strong trees with upright habit of growth. When pruning the weaker-growing varieties, the leaders should be kept somewhat more erect, because, when trees of this class bear heavy crops of fruit, the branches bend down, and when relieved of the fruit they are rarely able to regain their previous positions.

The four increasing quarter circles represent the corresponding quadrants in Plate 35, but they are drawn from the vertical to the horizontal to show the side elevation. It will be seen that progressive leader duplication results from the cutting at (a), (b), and (c), respectively. But when cut at (d), the single leader is maintained. Should the leader incline below the desired angle, in this case 40 degrees, it may be raised by cutting to the inner bud (f). But when the leader is

above the proper angle it may be directed into position by being pruned to the outer bud immediately below the (f) cut.

Plate 37 shows enlargement of circle (a) and the centre portion of Plate 35. The centre part is the section of yearling whip-growth cut to three buds, which produce the main arms of the tree. The three lines radiating from the buds represent the positions of the main arms when

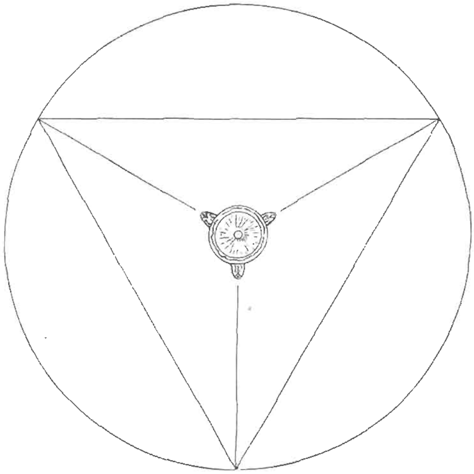


Plate 37.—Establishing the Tree on the Equilateral Triangle Principle.

produced. The circle indicates the points, about 6 inches from the crown, at which they should be pruned when the tree is two years old. Lines drawn as shown, from point to point of the main arms when cut, describe an equilateral triangle, which is divided by the main arms into three equi-angular figures.

(To be continued.)

MINERAL matter, or, as we term it, ash, goes to build up the framework, the bone of the animal, and to furnish the small amount of mineral matter (lime, phosphoric acid, &c.) which is found in the various tissues of the body. There is always a sufficiency of ash in the home-grown fodders to supply the needs of the animals.

CURING BACON.

A good method of curing bacon is the following:—The side is cut into three pieces—ham, flitch, and shoulder. The rind of each is well rubbed with fine, dry salt, the pieces being then placed on a stone slab or in a shallow water-tight wooden box, and sprinkled with salt. The curing of the flitch is effected by (1) applying a thin covering of salt; (2) a slight sprinkling of saltpetre; (3) a sprinkling of granulated sugar (a single handful); and (4) a final sprinkling of salt. The flitch is then left for four days, when the rind is again rubbed with salt, a very thin layer of which is also sprinkled over the surface.

In eight to ten days from the commencement of curing the salt is brushed from the flitch, which is then hung up to dry for ten to fourteen days, and finally covered with fine muslin and stored in a cool, dry room. The ham and shoulder are treated in the same way as the flitch, but are left "in salt" fourteen to twenty-one days, and sprinkled with salt at intervals of four or five days. The ham, especially, should be disturbed as little as possible. From a carcass weighing 280 lbs. the approximate amounts required are:—Fine, dry salt, 20 lbs. to 24 lbs.; saltpetre, 1 lb. to 1½ lbs.; sugar, 2½ lbs. to 3 lbs.

To smoke bacon after it is cured it is placed in water just warm enough to bear one's hands in it, and is then brushed over, which removes all fat, sugar, or slime from the surface. It is then placed in a tank or vat, and covered with clean cold water, in which it is allowed to remain for from 18 to 24 hours. This takes a lot of the salt out, and renders it a mild-cured bacon. The bacon is next hung up in a well-ventilated room to dry. If the weather is favorable, the days being fine and dry, with a slight breeze of wind during the greater part of the time, the bacon is generally sufficiently dry in from six to seven days.

In trimming the bacon, the sharp points of the rib bones are sawn off, and the remaining part of the foreleg also sawn off level with the shoulder. The knife is then run over the belly part of the rib bones, and any loose pieces removed. The sweat skin is scraped off with a sharp knife, and the side is then rubbed over with a little olive oil, which gives it a nice glossy appearance. The bacon is then placed in the smokehouse. The best smokehouse is where the fireplace is outside the smokehouse, and the smoke is conveyed through a flue to the interior. This allows of the bacon being smoked in a cool state, which is, of course, a great advantage. From four to five days' smoking is given, care being taken not to smoke too much, as this greatly affects the flavour.

—*Auckland Weekly News.*

THE application of lime in moderate quantities to the soil assists the beneficial processes always going on in fertile soils, due to the action of bacteria, thus helping the conversion of ammonia and other compounds containing nitrogen derived from decaying organic matter and nitrogenous fertilisers into nitrates, the form in which plants mainly, if not entirely, utilize nitrogen.

COMPARATIVE FOOD VALUES OF DAIRY PRODUCE.

By R. T. Archer, Senior Dairy Inspector.

Food is necessary to all organisms for their development and growth, to supply them with heat and energy, to make good the losses resulting from wear and tear of their mechanism, and to keep them in a state of efficiency.

The elements of all our animal and vegetable foods are derived from the inorganic earth, air, and water. It is obvious that animals could not live upon inorganic substances or derive nutriment from them, important as such inorganic materials are for many vital processes. The essential parts of animal structures are derived from previously organized materials. Most of these organic compounds arise in the vegetable kingdom as comparatively simple substances, and become elaborated into more complex bodies in the vegetable or animal organism. Therefore, it may be said that the constituents of human food, the elements of the human body are derived from the denizens of the earth, air, and water.

The materials which compose the structures of the man's body are derived from his food, and are in turn composed of inorganic substances to which they can be reduced. The most important of these elements are carbon, hydrogen, oxygen, and nitrogen, which form twenty-nine thirtieths of the entire weight of the body and enter into the construction of every cell. There are other elements which, even though they form but a small portion of the weight of the body, are of prime importance to the proper construction of the various parts of the body, *e.g.*, iron for the blood, phosphorus for brain and nerves.

The value of a food is estimated by the amount of heat (which is the equivalent of energy) that is generated by a given quantity when oxidized or burnt or consumed, which amounts to the same thing. This is expressed in heat units or calories. A calorie is the amount of heat required to raise a kilogram of water 1° Centigrade or 1 lb. of water 4° Fahrenheit.

The purpose for which food is required in the body is—

1. To build up the body tissue.
2. To develop heat and energy.
3. To repair the waste of tissue.

The principal kinds of nutritive ingredients are protein, fat, carbohydrates, and mineral matter or ash.

There are also present in most kinds of food, water, indigestible fibre, &c., which are called non-nutriments. In comparing the values of different food materials for nourishment, they are left out of account.

The digestible nutrients are divided into four principal classes as follows:—

Protein, e.g., albumen (white of eggs and milk), casein (curd) of milk; muscle (lean meat); gluten of wheat, &c. These are so called nitrogenous foods. Their particular function is to build up the cell system and repair waste of tissue. They will also produce fat and will generate heat or energy.

Fats, e.g., fat of meat; fat (butter) of milk; olive oil, &c. These form fatty tissue, not muscle, and generate heat and energy.

Carbohydrates, e.g., sugar, starch, cellulose (woody fibre), &c. These are converted into fat, and serve as fuel also.

Mineral matter or ash, e.g., phosphate of lime, iron, sulphur, salt, &c. These form the skeleton, &c.

MILK.

Milk is an article of diet whose sole function in nature is to serve as food.

The importance of the milk industry to the community is much greater than its money value (as compared with other industries) would imply. It is probable that the quality of the milk supply bears a closer relation to the public health than does that of any other food. This is partly because of the exceptional nutritive qualities of milk and the prominent part which it plays in the diet of children and others to whom the quality of the food is of special importance, and partly because the fluidity and opacity of milk offer unusual opportunity for adulteration; and the fact that bacteria readily grow and multiply in it makes it especially important that the milk be carefully guarded from contamination. It is, therefore, important that the milk industry be controlled with all possible care both as regards the nutritive and the sanitary qualities of the product.

The qualitative composition has been concisely stated by Richmond as follows:—

> "It is essentially an aqueous solution of milk-sugar, albumin, and certain salts, holding in suspension globules of fat, and in a state of semisolution, casein, together with mineral matter. Small quantities of other substances are also found."

The quantitative composition varies considerably with the different breeds of cattle, period of lactation, &c.

The average composition of cow's milk may be taken as follows:—

Fat	4.0 %
Protein	3.3 %
Carbo-hydrates ..	5.0 %
Ash	0.7 %
Total solids ..	13.0 %
Solids not fat	9.0 %
Water	87.0 %

Usual limits of variation—

Fat	3.0 % to 6.0 %
Protein	3.0 % to 4.0 %
Carbo-hydrates	4.6 % to 5.0 %
Ash	0.70 % to 0.78 %
Solids not fat	8.5 % to 9.5 %

Milk sugar and ash vary very little. Proteins usually constitute about one-fourth the total solids.

The economical position of milk may be gauged when it is borne in mind that one quart of milk is equal to 1 lb. of steak or to eight or nine eggs (that is, when the full fuel value is allowed to the steak, *i.e.*, 960 calories per lb., whereas, after the usual loss of fat in preparation and cooking the steak, only about 640 calories remain); but, from the point of view of its digestibility, milk has a great advantage over other foods, largely due to the nature of its constituents. The carbo-hydrates (lactose or milk sugar) are already in solution, and ready to be acted upon by the digestive juices of the intestines, and are less susceptible

to fermentation and less liable to irritate the stomach. The fat is already emulsified and more readily available to the body than the fats of other foods except eggs.

The proteins of milk are of high nutritive value. When milk is taken under normal conditions (even in relatively large quantity and in connexion with only a small amount of bread or other solid food) about 97 to 98 per cent. of milk protein is absorbed. Numerous recent digestive and metabolic experiments indicate that under normal conditions it is as completely digested and absorbed as any of the food proteins, and has the advantage of not containing the substances which yield uric acid in the body, nor of being readily susceptible to intestinal putrefaction. Not only do the milk proteins show a high coefficient of digestibility, but metabolic experiments and clinical observations show that milk furnishes a form of protein food particularly adapted to bring about a storage of protein in the body. This is considered due in part to the fact that casein contains phosphorus as an essential constituent. The ash constituents of milk are important, not only for their property of being adequate in the absence of all other ash constituents, but also in their bearing upon the adequacy of the phosphorus, calcium, and iron supply in a mixed diet. Phosphorus compounds are present in milk in relative abundance and in a variety of forms. Calcium is present in still greater proportion. Milk contains slightly more calcium, volume for volume, than does limewater. Iron is present in milk in only small quantities, but evidently in a form exceptionally favorable for assimilation, as a diet of milk and white bread appears to be adequate for the maintenance of iron equilibrium in man, whereas white bread alone in larger quantity on a diet of bread, and iron-free protein is much less efficient.

Furthermore, as the late Dr. A. C. H. Rothera explained, milk contains substances other than fats, proteins, carbo-hydrates, and salts, which perform important nutritive functions, especially in relation to growth.

Taking into consideration the many and important factors which increase the value of milk as food above that indicated by its mere proximate composition and fuel value, and also the fact that it requires no preparation and has no waste, it is believed to be true economy to make liberal use of milk in the diet so long as the milk does not cost more than twice as much in proportion to the energy it furnishes as the average food eaten. On this basis, families who must live on as little as 8d. to 10d. per person per day for food may wisely use reasonable quantities of milk at 5d. per quart, balancing this by a larger use of such food as bread, which furnishes energy much more cheaply than the average food of the diet. Especially in the feeding of children should milk be used freely, because of its many advantages as a "tissue builder" and "growth promoting" food. The vitamines which Dr. Rothera spoke about are found in milk, butter, eggs, and cod liver oil, but not in lard, cottonseed oil, or olive oil.

CHEESE.

A pound of cheese represents the casein and fat of a gallon of average milk. Cheese is thus a concentrated and economical food, especially when compared with other foods of animal origin. Generally speaking, cheese sells at no higher price per lb. than the ordinary cuts of meat, while it is considerably richer in both proteins and fats.

Cheese is very rich not only in proteins and fats, but also in calcium and phosphorus, since these elements in milk are largely in combination in or with the casein, and so concentrated with the casein in the process of cheese-making. The iron protein compounds of the milk are also retained in the cheese.

Digestibility.—Cheese should be looked upon as a food and given a rational place in a meal, and when thoroughly masticated is usually well digested. It should not be eaten at the end of a sufficient meal. The result of a large number of digestive experiments goes to prove that about 95 per cent. of the protein and over 95 per cent. of the fat of the cheese were digested and absorbed. The amount of cheese eaten by the men in the experiments, which were conducted by the Department of Agriculture, U.S.A., was from ⅓ lb. to ½ lb. each per day.

Langworthy and Hunt sum up the position as follows:—

"Experiments have shown that when eaten either raw or carefully cooked, cheese is as thoroughly digested as other staple foods, and is not likely to produce physiological disturbance. The fact that cheese, like meat, contains neither starch nor cellulose suggests that, like meat, it should be combined with bread, potatoes, and other starchy foods, with vegetables and sweets. The concentrated character of cheese and many cheese dishes suggests the use of succulent fruits and vegetables with them. The high percentage of fat in cheese suggests the use of correspondingly small amounts of fat in the accompanying dishes, while the soft texture of cheese dishes as compared with meat makes it reasonable to serve the harder and crustier breads with them. Though cheese is so generally used in some way in most families, yet the making of menus with cheese as a central dish is less well understood than more usual food combinations, since there is less experience to serve as a guide.

In order that the diet may remain well balanced, cheese, if used in quantity, should replace foods of similar composition rather than supplement them. This means that the housekeeper, in suitable ways, can use cheese, meat, fish, eggs, and other foods of similar composition as substitutes for one another, being governed by their relative market value at different times and seasons, by the tastes of her family and similar considerations. If she uses the different foodstuffs with reference to their nutritive value, and is skilful in preparing foods in appetising ways and in serving them in attractive combinations, the daily fare may be both adequate and pleasing, whether she selects cheese or meat or eggs or fish, or other foods to supply the nitrogenous material and fat. The only warning necessary is that overripe cheese may contain a considerable percentage of ammonia.

As the food value and digestibility of cheese becomes better known, it should come to occupy a much more prominent place in the dietary than it does at present. In England it is one of the staple foods, and consumed in large quantities, especially by men who do much heavy manual work.

The average composition of cheddar cheese is—Water, 35 per cent., fat, 34 per cent., protein, 25 per cent., salt, milk-sugar, lactic acid, and ash, 6 per cent.

The fat of cheese is in a finely-divided state, and should be quite uniformly distributed throughout the cheese mass. Chemically it has

the composition of milk, fat, or butter fat, and shows but little change as the result of the ripening process.

Protein of cheese consists chiefly of more or less digested casein (though to a small extent albumin also) of the milk. During the ripening process much of the casein is digested into a soluble protein and other compounds.

The ash of cheese is always high in calcium, phosphorus, and sulphur, and fairly high in iron, these elements of the milk being largely constituents of the curd; while the potassium, sodium, and chlorine of the milk are largely removed in the whey, but the sodium and chlorine are later more or less restored in added salt.

Butter.

Butter is the clean, non-rancid product made by gathering in any manner the fat of fresh or ripened cream into a mass, which also contains a small portion of the other milk constituents with or without salt, and contains not less than 82 per cent. of milk fat. Fuel value of butter containing 85 per cent. fat is equal to about 3,500 calories per lb.—84 per cent. fat represents 3,450 calories per lb.: 82 per cent. fat represents 3,370 calories per lb.

A lb. of butter is equal in energy value to 5 quarts of milk; but, in view of the proteins and ash constituents which the milk contains, it would probably be wise to consider that 3 quarts of milk fully equal to 1 lb. of butter as a food, except perhaps in those cases in which the energy problem distinctly predominates.

If any considerable number of consumers should decide to buy less butter and more milk, the diminished demand for butter and increased demand for milk would result in bringing to market some of the milk now used for butter-making. This would not appreciably disturb agricultural conditions, and would plainly tend towards a better conservation of resources for the community as a whole, because, under present conditions, the separator milk is not generally utilized to the best advantage. Economically, therefore, the making of butter should for the most part be carried on in regions which are adapted to dairy-farming, but too remote from cities and towns to send their milk to market, or in districts in which it is feasible to make good use of the separator milk. Year by year we see the city purveyors of milk going further afield for their supplies, and the country butter factories may well co-operate in this class of trade, which, as it becomes better organized, should be the means of improving the quality of milk brought to the city.

Value of Food Purchasable for 1s. at different Market Rates.

	Calories.
Butter at 1s. 6d. per lb.—1s. would purchase	2,550
Cheese at 1s. per lb.—1s. would purchase	3,400
Milk at 5d. per quart—1s. would purchase	2,020
Pork (fresh) at 8d. per lb.—1s. would purchase ..	2,852
Ham (smoked) at 8d. per lb.—1s. would purchase ..	2,799
Shoulder of mutton at 10d. per lb.—1s. would purchase ..	1,212
Leg of mutton at 1s. per lb.—1s. would purchase ..	917
Loin of mutton at 1s. per lb.—1s. would purchase ..	1,407
Beef (round) at 9d. per lb.—1s. would purchase ..	1,133
Beef (loin) at 11d. per lb.—1s. would purchase ..	1,076
Beef (rump) at 9d. per lb.—1s. would purchase ..	2,064
Potatoes at 6s. 6d. per cwt.—1s. would purchase ..	1,176
Wheat bread at 8d. per 4-lb. loaf—1s. would purchase ..	7,680

NOTES ON PORTUGUESE VINE VARIETIES.

By F. de Castella, Government Viticulturist.

(Continued from page 628.)

Souzão, Cornifesto, Mourisco Preto, and Donzellinho Do Castello.

The four varieties which form the subject of the present article, though not so pronounced in their characters (excepting perhaps Souzao) as Alvarelhao, Bastardo, and Touriga, which have already been described, are nevertheless standard sorts of the port wine region, and, as such, deserve detailed mention.

Souzão and Cornifesto belong to the Touriga type, since they produce wine of deep colour, for which reason they may prove of value in Victoria for the production of full-bodied dry red wines, as well as for communicating colour to wines of Port type. Souzão is especially interesting on account of its remarkable richness in colour.

Mourisco Preto and Donzellinho belong more to the Bastardo type, producing delicate aromatic wines of light colour; of the two Mourisco seems to be the sort of most promise in Northern Victoria, where it should yield excellent sweet wine. Curiously enough, it is also a very fair table grape.

Souzão.

Synonyms: Vinhão, Tinto do Minho, etc.

One of the most striking port wine grapes is undoubtedly Souzao, which may be considered to belong to the Touriga type on account of its remarkably high colour, though in other respects it is distinctly inferior to it in quality. Souzão was introduced into the Douro district over a hundred years ago, when the demand set in for ports of higher colour, and it is mainly the truly extraordinary amount of colouring matter it contains which renders it interesting.

Curiously enough, this grape is also remarkable for its high acidity, a fact which may render it of value in Northern Victoria, especially in dry seasons, when deficient acidity often requires correction. It is quite *possible that Souzão may prove of more value in Australia for increasing* the colour and correcting deficient acidity of dry wines than for the making of sweet wines of Port type. It may even prove of more value as regards colour than Alicante Bouschet, than which it certainly contains much more acid.

As to the exact way in which the colour is contained—whether in the skins alone or in both skins and pulp—there is a curious disagreement between some of the best known Portuguese authorities, as will be seen presently; the explanation is probably to be found in the statement by Sr. Cincinnato da Costa that there are two sub-varieties of this vine.

Rebello da Fonseca (1791) says of it:—

The English merchants who export the greater part of our wines give preference to those which are highly coloured. This led to the introduction into the Alto Douro of those varieties of grapes capable of giving to the wine the very darkest natural colour. Barnabé Velloso Barreto de Miranda, provedor* of the Douro Wine Company, and Dr. Pantaleão da Cunha Faria introduced plants of Souzão from the province of Minho, where there is much of it, and propagated

* Inspector-General of the celebrated *Companhia general das vinhas do Alto Douro*, created by the Marques de Pombal, with many privileges.

it largely in their vineyards, by this means arriving at obtaining very full wines (*muito cobertos*), and at the same time of a bright ruby colour; from these vineyards it spread throughout the Douro, and in reality it is the dark sort which should be preferred, because, besides colour, it has sweetness and flavour.

This and *Tinta da França* are the only grapes which have red juice; they should, therefore, convey the most durable colour to the wine.

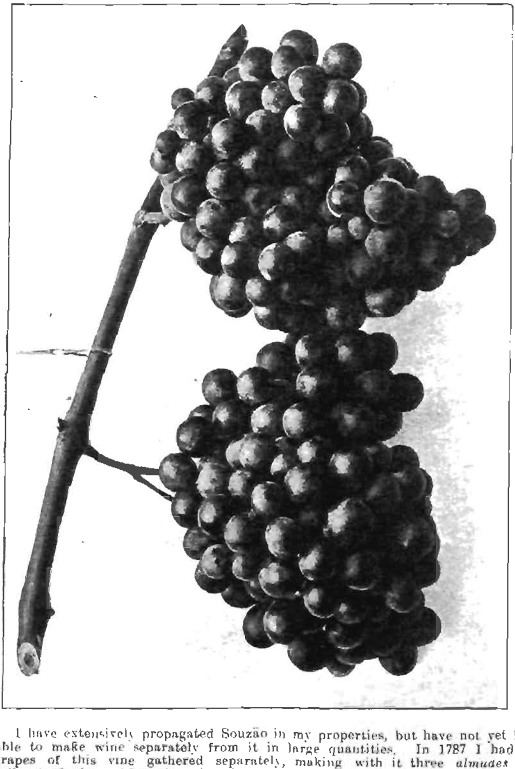


Fig. 10.—Bunches of Souzão Grapes.
Reproduced from *O Portugal Vinicola*, reduced to about half natural size.

I have extensively propagated Souzão in my properties, but have not yet been able to make wine separately from it in large quantities. In 1787 I had the grapes of this vine gathered separately, making with it three *almudes* (16½ gallons) of wine. After stemming, I again crushed the berries in a tub, where it was left to ferment, and as soon as the wine was made it was racked into a cask, the skins being pressed by hand. . . . I next had the skins washed with an

equal quantity of light-coloured wine, which became as dark as the first. I repeated the operation with a like quantity of wine, which also took a dark colour. Noting this, I ordered that all the wine be racked, together with the skins, into one cask holding about nine pipes (over 900 gallons), filling up with wine of very light colour, which was still fermenting. After it became clear, the wine of this cask was the darkest I had that year, with a very bright colour.

Antonio Gyrao writes at considerable length concerning Souzão:—

Its berries have a very particular structure, because in reality each berry is composed of two concentric layers—an exterior one, consisting of a hard skin, pulpy within, and much charged with colouring matter; and an interior one, composed of white insipid matter, and contained in a fine network. If a berry of Souzão be squeezed between the fingers, this interior zone, which I call second berry, is squeezed out, and from it can be obtained a perfectly white wine.

It yields much wine, but is bad in cold situations; on warm hillsides, in valleys with strong soils, it is good, and highly coloured; on hills and poor soils it yields scarcely anything. . . . It is *anneiro*, only bearing well every second year. It has the singular property of climbing up trees; there are three varieties, that with red stalks is best; it rarely sets badly, and the flowers are protected by a cap, which preserves the anthers from wasps and dampness. This variety was long unknown on the Douro, and it is stated that it was brought from the banks of the Lima.

Gyrão further states how a special colouring matter may be extracted for the purpose of deepening the colour of wines which are too pale. The method, which is not in accordance with modern pure wine legislation, consists in making a sort of jam with the skins, to which sugar and unfermented juice are added, the whole being boiled over a water bath. He recommends that the mixture, of about the consistency of honey, should be added to the grapes in the vat at the rate of two cantaros per pipe.

Rubião (1884) states that it yields good wine in some localities and bad in others. . . . . As it is *anneira* (bearing only every second year) it is well to note the year it yields wine, so as to prune accordingly.

Villa Maior (1886) mentions it—

as one of the sorts grown at Quinta* do Vesuvio, and one of the most estimable for the special wine there produced. It is planted separately and vintaged apart, as is done with Bastardo, to which it is not inferior(!).

It is chiefly esteemed on the Douro and in Minho for the great abundance and brilliancy of its colouring matter, which even serves to give to other wines which are too pale, a splendid colour, simply by infusion of the skins and its berries. . . . The best variety of Souzão is the one with a red stalk, and which has leaves washed with scarlet. The interior pulp of the berry does not furnish coloured must; the colour resides in the skin, which is very thick. A test made on 24th August, 1866, gave me 64 per cent. of must with a gravity of 1.099 (12¼°B.). It comes into leaf very late.

Figueiredo (1875) states that it is:—

remarkable by the colour with which it is very heavily charged (*Summamente carregada*); it is customary to cut it separately, racking the juice into a vat and leaving the skins to dry, so as to better extract their colour, mixing them later in the lagar (fermenting vat) or distributing them in the casks

Henry Vizetelly† says of it:—

Souzão . . . was brought from the banks of the Lima at the beginning of the last century (18th). It is round and thick skinned, and the must, which is sub-acidulous in taste, is remarkable for the abundance and brilliancy of its colouring matter. A splendid purple shade is communicated to wines of a light tint by merely having the skins of the Souzão grape steeped in them. This grape yields 64 per cent. of must in proportion to its weight, and contains, on an average, some 12 per cent. of sugar.

* Quinta signifies farm or vineyard.
† Facts about Port and Madeira.

As regards its high acidity, the following extract will prove of interest:—*

It is, of all the varieties of the Douro which are largely cultivated, that which presents the highest degree of acidity, being from this point of view even phenomenal. The following are analyses showing the acidity (expressed as tartaric acid per cent.) of a few Portuguese varieties in different vintages:—

Vintage.	1908.	1909.	1911.	1912.
Touriga	.625 ...	.632 ...	.625 ...	.875
Tinta Francisca	.475 ...	.562 ...	.475 ...	.925
Tinta Carvalha ...	.550 ...	.554 ...	.425 ...	.725
Souzão	.770 ...	.879 ..	.750 ...	1.175

The high acidity of Souzão explains the important part it plays as regards colour in Douro wine making.

Sr. Cincinnato da Costa says of it, in *O Portugal Vinicola*:—

Souzao is, in my opinion, the blackest of all the grapes cultivated in Portugal. It is, at any rate, the darkest in colour of the 94 varieties I have more specially studied. Like *Espadeiro de Basto,* Souzão is one of the few Portuguese grapes *which have black pulp; it is even blacker than that of Espadeiro.* The flesh is entirely of a blood red colour, and the must is deep ruby, very deep, as is no other must.

It is a curious fact that, whilst the must of most sorts is cloudy, even after filtration, that of Souzão, passed through cotton wool, is without matter in suspension, *almost as limpid and brilliant as a finished wine. . . . . This* peculiarity is also shown by another variety, viz., Sercial or Esgana Cão, but in a less striking degree.

Souzão is cultivated as Basto (Northern Portugal); it helps to give to these wines (light dry red) their brilliant colour and the roundness (*Suiradade*) which *is characteristic of them. It is also grown in several other* Portuguese dry-wine districts in order to deepen colour.

There are two distinct varieties of Souzão—*S. de pe verde* (green foot or stalk) and *S. de pe vermelho* (red foot)—the last is the most esteemed; it is the one with dark-coloured pulp, and which produces the most highly-coloured wine; the *shoots are tinted with scarlet. This is the only type which I examined.*

At the close of tumultuous fermentation, Souzão deposits a thick layer of yeast at the bottom of the cask.

Sr. Duarte de Oliveira, in the article on this vine in *Ampelographie*, gives much information, quoting at considerable length from several of the authorities mentioned above. He states how Souzao was used to replace the *Bagos de Sabagueiros* or elder berries which were largely used as a source of colour on the Douro over a hundred years ago. This is an interesting subject, which will be again referred to in a future issue. The following additional information is abridged from his article:—

Souzão does well in all soils; on deep moist soils it bears very heavily. On dry hillsides it sometimes suffers from sunburn. In Douro and Traz os Montes (port wine region) it is pruned short. On the deep granitic soils of Minho it must be pruned long, owing to its tendency to run to wood at the expense of the fruit. In this last district, where vines are trained to trees and on high overhead trellises (*em forcado* and *remadas*) it does splendidly and yields heavily; by nature it is a vigorous climber suited for great expansion, but the setting of the fruit is sometimes uneven (*millerandé*). It comes into leaf a little after most varieties, so that it rarely suffers from spring frosts. It ripens rather late, being only quite ripe towards the second or third period (*Pulliat*).

It yields heavily on Rupestris du Lot, but if the weather be very hot at complete maturity the bunches suffer from sunburn. Ripaira Gloire and especially 3309 are to be preferred.

* *Vinificacão Moderna*, by Pedro Bravo and Duarte de Olviera, p. 529.

In Minho it does very well on A.R.G.1.

It is especially good for highly-coloured wine, its juice being nearly as deep as that of Alicante Bouschet, but more of a deep ruby or garnet-red colour, which is very durable. Its wine, which has but little bouquet, has much body, and it is readily realized that it should be an excellent blending sort, for the great vineyards, where choicer varieties predominate. For light and delicately-perfumed table wines, however, its proportion should not be exaggerated. On tasting, it is found to have a delicate but full flavour, with a peculiar character, reminding of the after-taste of a peach.

In cooler regions it ripens late, and the stalk remaining green renders the wine hard and astringent unless the grapes be stemmed.

Its fermentation is very long, and, if made alone, after the Portuguese fashion, in vats with a large surface exposed to the air, in spite of repeated trampling with the human foot, complete fermentation takes so many days for its accomplishment that there is a risk of the skins becoming acetic before the gravity has fallen to 0° B.

The opinion expressed by Gyrão as to the double structure of the berry is contradicted, the statement being made that—

The colour is contained exclusively in the skin. By slight pressure an ashen-coloured or at most a slightly reddish juice is obtained, which proves that the colouring matter is by no means to be found in the pulp of the berry, this being contrary to the statement of Antonio Gyrão. The following gravities are mentioned as having been obtained at different localities :—

	Gravity.	Degrees Beaumé.	Sugar per cent.	Absolute Alcohol (vol.)
Murça (Traz os Montes) ...	1.091	12°	21.2	12.5
Castedo (Alto Douro) ...	1.116	15°	27.9	16.4
Castanheiro do Norte (Alto Douro)	1.099	13°	23.4	13.8
Moncorvo (Traz os Montes) ...	1.108	14°	25.8	15.2

The comparison made by Dr. Adelino Costa in 1901 of musts of Souzão and Alicante Bouschet, at Guimaraes (Minho) is quoted as follows :—

	Gravity.	Degrees Beaumé.	Sugar.	Alcohol.
Souzao or Vinhão ...	1.083	11°	19.1	11.2
Alicante Bouschet ...	1.071	9½°	15.9	9.3

Sr. de Oliveira comments on the enormous difference in gravity to the advantage of Souzão, "which has certainly a wine-making value superior to Alicante Bouschet in every direction, unless, perhaps, that of yield." As regards the parts played by Souzão for the making of green wines*, he quotes a letter received from Sr. Antonio Christino, in which he wrote :—"This vine finds itself here in its true home, and constitutes to-day the basis of choicest wines of Minho."

The following ampelographical description is given :—

Vine.—Vigorous; trunk cylindrical; bark light-brown, easily detachable in short strips.

Buds.—Breaking at a medium period; young leaves yellowish above and whitish beneath.

Canes.—Long, round or slightly flattened, trailing, striated with russet veins; when matured, of a vinous chestnut, the striations becoming deep sepia; internodes very irregular (6 to 12 cm.)†; knots only slightly marked, brittle, tinted with carmine; tendrils numerous, very long.

Leaves.—Three lobed, thick, pliable, large, as broad as long, yellowish-green on both sides, but the upper side is deeper, cottony, at the end of the season (in late summer) blotched and dotted with carmine red and in October becoming yellow smeared with red; underside woolly; veins prominent and light-yellow on the underside, of same colour on the upper side, but later in the season assuming a carmine colour; substance very thin; the two sinus scarcely formed by the development of three teeth of the upper lobe, the terminal lobe being very large and projecting forward, sometimes the sinus are U-shaped; petiolar sinus deep, almost closed; teeth alternating, large, pointed, and carmine when the grapes are ripe. Leaf stalk long, cottony, striped with red.

* The light dry red wines of high acidity grown in the north of Portugal.
† 2⅓ to 4⅔ inches.

Fruit.—Bunches fairly large, long, cylindro-conical, regularly filled, but not very close. Nearly always shouldered, with one or two bunchlets hanging by long stalks, which have the form of true bunches; sometimes the stalk is divided so as to bear two similar bunches; stalk long, strong, flattened; first ramification short and woody; pedicels short, stout, terminated by a rather strong swelling, dark-red; core short, conical, deep vinous red. Berries medium, spherical, of a bluish black colour, solidly attached to the core; flesh fairly firm, juicy, not very sweet, and not very refined; skin thick, like parchment, rich in colouring matter; pips per 100 berries—24 with two, 52 with three, 24 with four.

Cornifesto.

SYNONYMS: CORNIFRESCO, CORNIFEITO, TINTA BASTARDEIRA.

Cornifesto is one of the characteristic varieties of the Douro; yielding, as it does, wines of good colour and body it may be classed as belonging

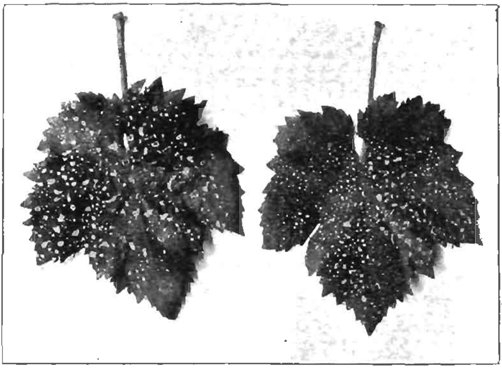


Fig. 11.—Leaves of Cornifesto (about one-third natural size).

Photo. taken at Boa Vista, Alto Douro, Portugal, in October, 1907. The leaves are spotted with Bordeaux mixture, sprayed to prevent Downy Mildew (*Plasmopara viticola*).

to the Touriga type, though its wine does not perhaps reach the same standard of quality as that variety. A peculiarity which renders it of considerable interest is its marked tendency to throw a second crop. In all probability it will be found capable of yielding satisfactorily in seasons when the first crop has been destroyed by frost or hail, a consideration of great value in vineyards liable to such visitations.

It is first mentioned by Lacarda Lobo (1790) as a black variety cultivated in several Douro vineyards. Gyrão (1822) tells us that—

Cornifesto yields much and good wine; it possesses the peculiarity of bearing a second crop on the lateral canes (*pela vara adiante*), which alone would equal the yield of some other vines; this second crop constitutes a sort of supplement to the numerous and handsome bunches which it yields. It likes strong soils.

Villa Maior (1866/69) mentions having seen it in several localities in the Alto Douro, where it is highly esteemed; it resists odium, yields well, and produces good wine. A test of the must at Moncorvo gave a gravity of 1.120 ($15\frac{1}{2}$°B.), and acid 0.21 (as sulphuric). Another determination by the same author in 1875 resulted in a yield of must of 53.5% of the weight of the grapes, the gravity being 1.090 (12°B), and acidity 0.188.

Vizetelly* says of it:—"The species of vine known as the Cornifesto has the peculiarity of throwing out along its branches a number of productive off-shoots.

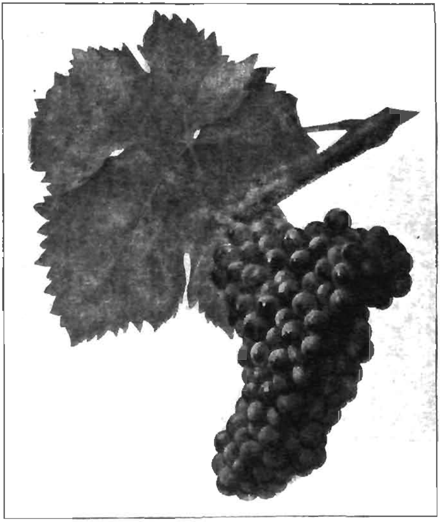


Fig. 12.—Bunch of Cornifesto, reduced from coloured plate in "Ampelographie" (about one-third natural size).

Its fruit possesses the usual characteristics of the Alto Douro grapes, being thick-skinned, sweet, and pulpy, whilst the yield in must and sugar is of a fair average."

Sr. Cincinnatto da Costa† mentions it as a good black grape of the Douro, bearing abundantly, its bunches being as large as they are numerous. He agrees with Villa Maior regarding the production of second crop; nevertheless, the yield in juice is not very high.

* Facts about Port and Madeira, by Henry Vizetelly, 1880.
† O Portugal Vinicola.

The article concerning this variety in *Ampelographie* is contributed by Sr. Duarte de Oliveira, from which the following is abridged:—

The name of the variety is appropriate—*Corni* signifying horn-shaped, and *festo* meaning bent; in other words, bent horn, referring to the bunch, which is curved in a peculiar manner.

Curiously enough, Columella, at the commencement of the Christian era, wrote of a vine named *Ceraumia*, which appears to have had some similarity with Cornifesto. "We call this vine *Corneolus*, according to Greek nomenclature. Here we have it both black and white, and it bears three times a year (no doubt referring to the large amount of second crop). Cornifesto is, of recent years, a scion much used in grafting, and is to be found, nowadays, in the majority of Alto Douro vineyards."

It comes into leaf late, but ripens at the same time as most other sorts, except in moist situations, where it ripens with difficulty, though it produces numerous bunches. Especially when grafted on resistant stocks it yields fine bunches, well filled with juicy grapes. Being a good bearer, and resisting fungus diseases, it is given a high place in the great port wine vineyards, since it supplies colour, which is lacking in many varieties cultivated in these vineyards. It possesses excellent affinity for the majority of resistant stocks, doing specially well on A.R.G.1, the horn shape of each bunch being accentuated. It does best on very vigorous stocks.

On the Douro it is either pruned short, or according to the "double Guyot" method (on vines which are strong enough). It may even be pruned very long, when the yield is heavy; if pruned too long, however, though the bunches are numerous, they are small and poor.

It plays an important part in the making of port wine. Although not of ideal distinction, its wine is of intense colour and has much briskness. It livens up the softness of other sorts, and gives them the "life" which is missing. Wine made from it alone is coarse and common, but mixed with Alvarelhão, Bastardo, Donzellhino, do Castello, Touriga, and other celebrated varieties, the value of Cornifesto for port wine making will be immediately recognised. If not present in all vineyards, it ought to be; without Souzão and Cornifesto the wine would not possess enough colour.

Cornifesto became popular with the change in fashion which demanded darker ports. It is chiefly by the extensive use of Cornifesto, Souzão, and Touriga that this transformation was brought about. The following ampelographical description is given:—

Vine.—Strong, vigorous; spreading grower; bark dead leaf colour, detaching in long fibrous ribbons.

Buds.—Large, broad at the base, and pointed; young leaves five-lobed, silky above, yellowish-white, margined with bright carmine; cottony beneath, of an ashy white; teeth scarcely indicated.

Canes.—Long, compressed, straight and striated; internodes from 4 cm. (1½ in.) at the base, and from 8 to 10 cm. (3 to 4 in.) at the tip, of a brownish tint; knots small, reddish; tendrils numerous, slender.

Leaves.—Medium, as long as broad; substance not very thick, light-green, glabrous above, slightly downy beneath; five-lobed; sinus not deep, especially the lateral ones, which are scarcely indicated; petiolar sinus forming a small oval opening; main veins of yellowish colour, rather prominent on the under side, with reddish spots; teeth long, irregular, sharp. Leaf stalk striated, long, reddish.

Fruit.—Bunches large, long, close, irregularly cylindrical, often horn-shaped, with cavities produced by missing berries; stalk medium length, cylindrical or flattened, sometimes divided into two or three, bearing secondary bunches smaller than the principal one; pedicels strong, short, terminated by a large warty swelling, of vinous colour; core short, pulpy, red in the centre, adhering strongly to the berry. Berries medium, spherical, black, with bluish reflection; skins thick, hard and elastic, colouring matter abundant; pulp sweet, fairly juicy; pips per 100 berries—16 with two, 37 with three, 33 with four, 12 with five, 2 with six.

Mourisco Preto.

Synonyms: MOURISCO TINTO, UVA REI, MORTAGUA, OLHA DE REI, TINTA PARDA, VALENCIANA, ETC.

In Mourisco Preto, or, as it is often called, Mourisco Tinto (tinto and preto both meaning dark coloured or red) we have what may be

termed a dual purpose grape, or one which is of value as a table grape as well as for conversion into wine. Though not so showy as the large berried grapes in favour on the Melbourne market, in its native Portugal it is largely grown and highly esteemed for table use in the fresh state.

For wine making it may almost be classed as belonging to the Bastardo type; its wine, though lacking somewhat in colour, is remarkable for bouquet and flavour, though not to quite the same extent as Bastardo. It is, nevertheless, essentially a quality variety, in this respect being an exception to the general rule that table grapes do not yield high-class wine. It is a variety which should prove of interest in northern Victoria as one of the port wine sorts, possessing many of the qualities of the Bastardo without its serious defect of drying up in hot weather.

Its comparative resistance to phylloxera led to great hopes being founded on it when the vineyards of Portugal were first ravaged by the

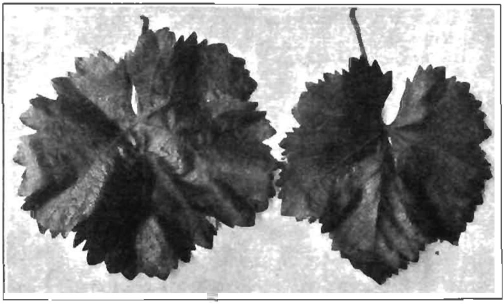


Fig. 13.—Leaves of Mourisco Preto (about one-third natural size).

Photo. taken at Boa Vista, Alto Douro, Portugal, in October, 1907.

insect. Much credence was given to the common fallacy that phylloxera was the result of a general weakening of the vines, resulting from repeated propagation by means of cuttings, and that a return to nature's methods (by seed) would permit the raising of vigorous vines capable of resisting phylloxera. Large areas were replanted with seedling vines, mainly Mourisco, but without avail; the seedlings succumbing as completely as other viniferas, if rather more slowly.

Mourisco is a very old Portuguese variety, the white variety being mentioned as early as 1712 by Vincencio Alarte.* The red variety seems to have been first mentioned by Lacerda Lobo in 1790. According to tradition on the Douro, it was one of the most widespread vines, though it lost ground somewhat owing to imperfect setting.

* Sr. Duarte de Oliveira in *Ampelographie*.

Gyrão (1822) describes it, among the black grapes of the Douro, as one which

yields much and very good wine; it is early and requires strong soil; it should be pruned to spurs, because each shoot only bears two bunches. It is good to

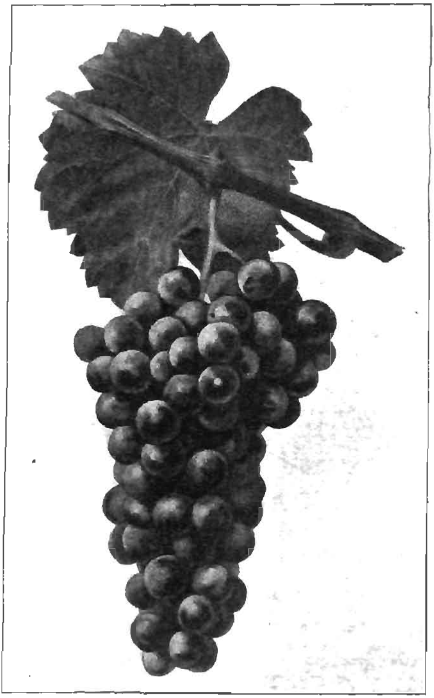


Fig. 14.—Bunch of Mourisco Preto, reduced from a coloured plate in "Ampelographie" (nearly half natural size).

eat and for wine. Its grapes are very sweet. . . . It is best trained low, but may also be trained on trees; the wine is full (*coberto*), and its grapes ripen early; it likes strong soil, but also prospers on poor land. The wine made on the Douro by Srs. Villares from this grape was excellent in colour, flavour, and bouquet; it made a good blend with Souzão.

Rubiao (1844) states that—

It is one of the red grapes of the Alto Douro, which, in spite of having a thick skin, yields good wine; it requires spur pruning.

According to Villa Maior (1866-75),

It is called Uva Rei at Macedo, and also in Traz-os-Montes, but must not be confounded with the Mourisco of Minho (North Portugal), which is entirely different. At Vesuvio (Alto Douro) it yields excellent wine, and ripens early; it is in general planted apart from other sorts, and its wine made separately. The yield of must is given as 55 per cent. of the weight of the grapes, with a gravity of 1.120 (15½° B.), and containing 0.188 per cent. of acid (as sulphuric). On the Douro it comes into leaf at a medium period.

Ferreira Lapa (1866-74) states that—

At Azeitao, on the Tagus, a district producing dry wines, Mourisco Preto, or Mortagua, is very productive, but suffers extremely from oidium. It is a variety from which a wine is made without mixture of others; a special wine which belongs to the category of choice or of choicest (*Finos ou finissimos*).

According to Dr. Paulino Oliviera (1878),

On the Douro Tinto Cao, Rabo de ovelha, Alvaraça, Souzão, and especially Mourisco, resist phylloxera much more than other varieties; in vineyards completely lost, where portions have been already eradicated, plantations of Mourisco have been preserved, which, in spite of phylloxera, continue to yield a regular crop.

Visconde de Villar Allen (1878-79) also writes concerning its phylloxera resistance, and advises raising seedlings of it for the regeneration of the vineyards.

Vizetelly* says—

Next comes the Mourisco Preto or Tinto, which the Trazmontanos have nicknamed the "Uva Rei," or King Grape, thick-skinned and pulpy like Touriga, less sweet, but pleasanter in flavour, and yielding in must 55 per cent. of the weight of its bunches.

Sr. Duarte de Oliveira, in *Ampelographie*, quotes from several of the above authors, and gives further particulars from which the following is abridged:—

During some years after the phylloxera invasion, Mourisco Tinto regained great favour with vine-growers. Important plantations were made with this vine, which was wrongly considered resistant, a mistake which has also been made in connexion with some other pure viniferas.

The wine-making value of Mourisco was affirmed by Villa Maior, who said, in 1876, "it is one of the finest and most precious sorts cultivated on the Douro."

Mourisco Tinto is grown as a table grape in all the Portuguese vine districts, but as a wine grape it is almost exclusively to be found in Traz os Montes and the Douro, being largely grown in some of the best port wine vineyards. In North Portugal, it is considered one of the best table grapes, playing as important a part as Chasselas does in France.

It has many of the qualities needed in an excellent table grape, and much resembles Black Hamburg.

In good years, and pruned long, it is very productive. In order to acquire perfect ripeness, it needs rich soil and warm regions like the Alto Douro. It ripens between the second and third period (Pulliat), and only rarely attains a jet-black colour. Mourisco suffers little from oidium, and mildew rarely damages it.

Its wine is of the most delicate flavour, and, mixed with other grapes, it communicates to the blend a very choice bouquet. On the Douro it is very fruity (liquorex), but for port wine it is blamed with not having colour enough. Ferreira da Silva is quoted as stating that its wine contained alcohol 13 per cent. by volume (22.8 per cent. proof); dry extract, 27.3 per cent.; and acid, 2.2 per cent. (as sulphuric). He also quotes M. J. Joulie as giving the gravity of its must in Minho as 9 degrees B., and in Traz os Montes (Murça) as 13 degrees B.

* Facts about Port and Madeira.

The following ampelographical description is given:—

Vine.—Exceedingly vigorous; trunks reddish, colour of wine lees, bark detaching in small plates.

Canes.—Slightly flattened, very strong and long, semi-erect, light-brown with vinous red striations, internodes very long, between 10 and 14 c.m. (3.9 to 5.4 inches); knots swollen; tendrils numerous, exceptionally large and strong; young growth almost glabrous, yellowish-green; young leaves with a slight brick-red tint.

Leaves.—Five-lobed, as broad as long, dark-green and glabrous above, yellowish-green and with little cotton below. Upper sinus somewhat irregular, more or less closed, the lobes meeting; secondary sinus sometimes scarcely marked; petiolar sinus very deep and open, though frequently through the overlapping of the lobes only a small obovoid opening is left. Substance of leaf thick, bulgy, almost leathery; veins very marked on both sides; teeth large, uneven, sometimes sharp, sometimes rounded, mucronate. Stalk long, grooved, glabrous.

Fruit.—Bunches very large, often enormous, elongated, pyramidal, winged; stalk strong, very long; pedicles thin, long, terminating in a fairly thick swelling; core short, white, with a small vinous spot in the centre, with much pulp adhering to it. Berry very large, almost spherical, of a jet-black colour, with bluish reflections, ripening unevenly, so that some not quite ripe are of a rosy-black, as though velvety. Skin not very thick; flesh firm, very juicy, and of a refined taste; on rich moist soil, before complete ripeness, the berries are already very sweet, and of almost the same colour as Chasselas Rose.

Donzellinho Do Castello.

Donzellinho, or, to be more correct, the Donzellinhos, since there are no less than five sub-varieties, are very ancient Portuguese vines, being mentioned by Ruy Fernandez so early as 1532 among the sorts cultivated at Lamego. They are essentially "quality" varieties, the red sorts being of Bastardo type, though the wine they yield is lighter in colour and of rather lower alcoholic strength than that of Bastardo.

Of the five sub-varieties, that known as Donzellinho do Castello is the most valuable; the others may be briefly mentioned as follows:—

Donzellinho Gallego.—A poor bearer, though it yields an excellent wine, of somewhat deeper colour than that of Donzellinho do Castello. The name Gallego, which means from Galicia (Spain), is really a term signifying inferiority, and is illustrative of the contempt in which the Galician labourer, who does most of the hard work on the Douro, is held by the Portuguese peasant. This feeling is probably as much due to envy of his capacity for hard work as to political reasons.

Donzellinho Branco (white).—Yielding a very highly perfumed white wine.

Donzellinho Malhadò.—A queer marbled or piebald grape, grown more as a curiosity than for use. Its origin has been attributed (no doubt erroneously) to the grafting of the red on to the white sub-variety, so that it would constitute a sort of a sexual hybrid.

Donzellinho Rosa.—A pink sub-variety of little practical value.

Donzellinho do Castello, in spite of the quality of its wine, is very liable to suffer from sunburn in a dry autumn, a feature which is against its extensive use in northern Victoria. It is mentioned by Rebello da Fonseca (1791) as softening and sweetening the roughness of Souzão and Alvarelhao, increasing the suavity of the bouquet.

Other authorities speak highly of it; notably Gyrão (1822), who states that—

It gives much and good wine; wants strong and cool soil. On warm hillsides the fruit dries up very much. Srs. Villares found that the wine made from it was good, though of little colour. It is a vine of such good quality that, like

Alvarelhão, even laterals and water shoots produce grapes, forming an exception to the rule.

Villa Maior (1865-69) mentions it as one of the predominant varieties in the quintas* of Silho, and of Pedra Caldeira; it was also selected

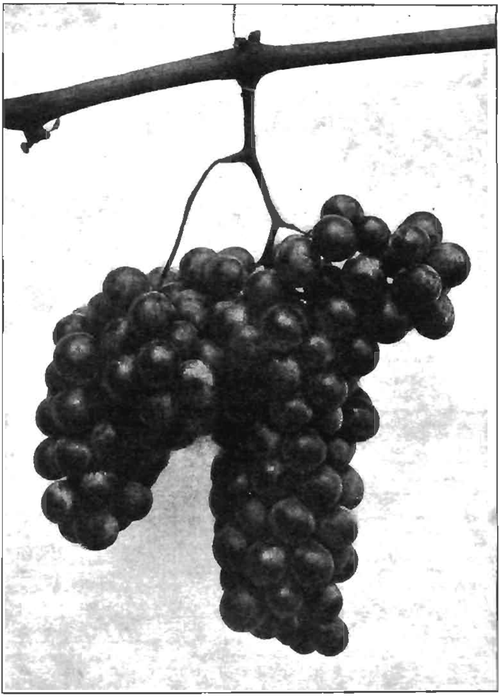


Fig. 15.—Bunch of Donzellinho do Castello. Reproduced from "O Portugal vinicola" (reduced to three-fifths natural size).

for cool and windy parts of the Quinta do Noval—a choice justified by its earliness, it being thus possible to insure the simultaneous ripening of the grapes throughout the quinta.

* Quinta signifies farm or vineyard.

Vizetelly* describes it as

a bluish-black grape which combines a slight acidity with a delicate sweetness, and yields a clear must charged but slightly with viscous matters.

Sr. Cincinnato da Costa† describes it as one of the choicest varieties in the Douro region—

The grape is black, but not deeply coloured. The crop is generally mediocre, and the yield of juice likewise. . . . Although not very profitable as regards yield, it is much appreciated owing to the excellent qualities of its wine. It enters largely into the composition of the best of the generous wines of the Douro.

The following extracts are abridged from Sr. Duarte de Oliveira's article concerning this vine in *Ampelographie*:—

In the ancient Douro vineyards, Douzellinho do Castello was grown in large proportion, contributing considearbly to the quality of the wines of the Douro region. It lost favour owing to the liability of its fruit to shrivel on dry sunny situations. Prior to phylloxera, it played a predominant part in several of the leading port wine vineyards.

It does well on all usual stocks, yielding heavy crops on A.R.G. 1 and Rupestris du Lot. On the deep rich soils of Minho it thrives on Solonis, growing *with great vigour. It is here trained on high trellises, and even on trees, for the* production of green wines (light dry table wines).

In the port wine region it is pruned short or medium. In cold, moist districts its wood sometimes ripens in an unsatisfactory manner. On soils which suit it, it is a good bearer, and very resistant to oidium, though it suffers somewhat from mildew.

It is one of the choice wine varieties of Douro and Traz os Montes, especially of the latter, yielding a delicious wine, of light colour, with a suave perfume, and of light body. Crushed with a variety containing more colour, a wine is obtained reminding of that of Cabernet Sauvignon. The grapes become sweet before they have acquired the colour characteristic of complete ripeness, which takes place between the first and second periods (Pulliat).

The following ampelographical description is given:—

Vine.—Vigorous; main stem strong; erect grower, bark dark-brown, much fissured, detaching in short thin strips.

Buds.—Large, swollen, short, but very prominent; young leaves white, very silky on both sides, pale-green above, and marked with carmine.

Canes.—Long, straight, cylindrical, brittle; glaucous green, sometimes lightly striped with vinous red whilst still herbaceous, of medium thickness; when ripened they pass to a reddish-yellow chestnut colour; internodes long (8 to 12 c.m.—3.1 to 4.7 inches), with a slight depression for half their length; knots swollen; tendrils very numerous and strong, generally bifurcated.

Leaves.—Large, broader than long, bulgy; faintly five-lobed, almost entire: upper sinus not deep, the secondary ones do not exist, or are usually so slightly marked that the leaf is three-lobed, petiolar sinus deep, distinct, in the form of an inverted lyre; substance very thick, dark-green above, sometimes with reddish blotches; greenish-white and woolly below; veins well marked on both sides: teeth shallow, irregular, mucronate. Leaf stalk strong, striated with red and dotted with deep chocolate.

Fruit.—Bunches numerous, medium or small, cylindro-conical, well filled, sometimes slightly winged, frequently some of the tendrils bear little bunchlets of four to eight berries: stalk medium, cylindrical, the upper part becoming woody, and the lower part remaining green; pedicels long, thin, with a vinous-coloured swelling; core fairly long, red, wine-coloured, adhering to the berry. Berries medium, almost ovoid, often unequally angular through compression in the bunch, bluish-black; pulp soft, juicy, sweet, and perfumed flavour; skin hard, with very little colouring matter; stigma persistent on nearly every berry, hard, and thus forming a sort of small point, of a dead leaf colour (when handled this point can be easily felt; this is one of the Portuguese varieties in which this character is most marked); pips per 100 berries—12 with one, 32 with two, 48 with three, 8 with four each.

(To be continued.)

* Facts about Port and Madeira, by Henry Vizetelly.
† O Portugal Vinicola.

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Government Apiculturist.

XXVI.—THE HONEY FLORA OF VICTORIA.

(Continued from page 486.)

The River White Gum (*Eucalyptus radiata*. Sieb.).

(Fig. 53.)

A fairly tall tree, with a hard, black bark on the lower portion of the trunk, but smooth on the upper part of the tree. The sucker leaves are thin and stalkless or almost, stem surrounding resembling those of the narrow-leaved Peppermint (*E. amygdalina*); they are opposite, narrow, and about 3 to 4 inches long. The leaves of adult trees are lance-shaped, generally about 6 inches long on a stalk about 1 inch long.

The veins of the leaves are not prominent, the marginal one removed from the edge. The flowers are very numerous, there being up to thirty in a cluster, which occur at the shoulders of leaves; the flower-cup is top-shaped, tapering into a long thread-like stalk, the lid (top) of the bud is blunt. The fruit is numerous, small, pill-shaped on thread-like stalks, rim thin, contracted.

The timber is pale, easily split and worked, and appears suitable for building purposes. The leaves yield a useful oil.

This tree is found in Victoria along rivers and creeks, principally in the eastern part of the State.

The Grey Ironbark (*Eucalyptus paniculata*. Sm.)

(Fig. 54.)

A tree of medium size, usually 60 to 70 feet in height, with a diameter of 2 to 4 feet; exceptionally it attains a greater size. It is found chiefly in New South Wales, but extends into Eastern Victoria, occurring at Mount Taylor.

It is known by different local names such as Grey Ironbark, White Ironbark, on account of the paleness of the timber as compared with the Red Ironbark (*Eucalyptus sideroxylon*), also as Ironbark and Red Ironbark, in reference to the pale-red colour of the wood.

The leaves are scattered, of rather thin consistence, narrow lance-shaped, long lance or sometimes broad-lance shaped, slightly curved, paler and dull coloured beneath, hardly shining on the upper surface. The lateral veins of the leaves are very spreading, faint and numerous, the marginal vein close to the edge of the leaf.

The flowers occur in tufts or panicles, hence the specific name "*paniculata*." A few of the flowers, however, also appear at the shoulders of leaves and in single clusters of from three to eight flowers on slender angular stalks. The buds are egg-shaped, tapering into the stalk, the calyx (flower cup) generally longer than the half-round, more or less pointed lid. The fruits, which are sometimes much smaller

than the normal type, are somewhat pear-shaped, slightly contracted at the summit, three to four, or rarely five-celled, with two to four angular streaks.

The bark is of the hard rugged kind as indicated by the popular name; it is often pale-coloured, even grey, while that of the Red Ironbark (*Eucalyptus sideroxylon*) is almost black.

Fig. 53.—The River White Gum (*Eucalyptus radiata*, Sieb.).

The timber, which is pale pink when freshly cut, becomes darker with age, is not excelled by any other timber for combined strength and durability.

The Grey Ironbark is not easily confused with any other Victorian species, as only two others, the Red Ironbark (*E. sideroxylon*) and the

Silver Top (*E. Sieberiana*) have the characteristic bark. The Red Ironbark has a deep red wood and a black bark as distinguished from the pale pink wood and paler or greyish bark of the Grey Ironbark. Both these species grow on ironstone ridges and dry, poor land, while the Silver Top (*E. Sieberiana*) inhabits moister situations.

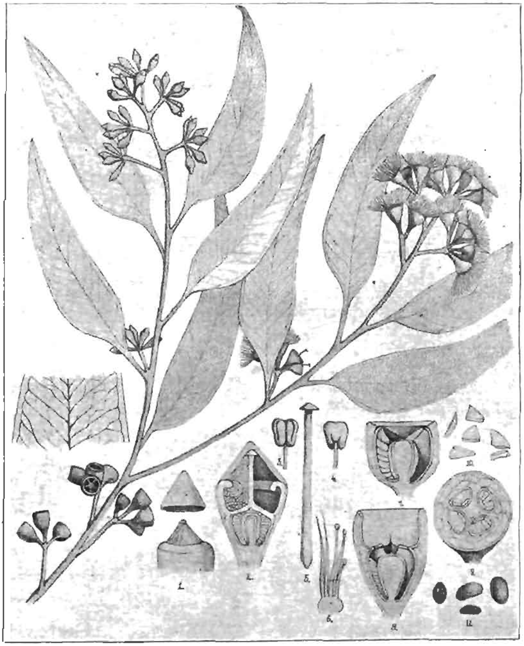


Fig. 54.—The Grey Ironbark (*Eucalyptus paniculata*, Smith).

THE SHINING GUM (*Eucalyptus nitens*. Maiden).

A very large tree, growing to a height of 200 to 300 feet, with a stem diameter from 2 to 17 feet. It is closely related to the Mountain Gum (*E. goniocalyx*) of which till lately it was considered a variety, but is now classed as a distinct species. It is known by local names, such

as White Gum, Silver Top, and Silver Top Gum in reference to the smooth and shining bark of the upper part of the trunk.

The bark is of the White Gum kind, hanging in strips, and more or less rough at the butt, the upper portion of the trunk smooth and even shining.

The timber is straight in the grain, flesh-coloured when fresh, but drying very white.

The leaves in the mature state of the tree are lance-shaped, slightly curved, nearly even-sided, equally green on both sides, somewhat shining and thickish, the veins spreading, the marginal vein distant from the edge of the leaf. Mature leaves may attain a length of over 12 inches, and a width of 3 inches, but usually they are much smaller: juvenile leaves, bluntly lance-shaped, or heart-shaped and stem-clasping, equally green on both sides and somewhat frosted; branchlets square and evenwinged (as in Blue Gum seedlings).

The buds are usually pale-brown, curved and angled, up to seven in a head, six stalkless buds surrounding a central one on a common stalk ¼ inch long; lid of bud pointed and longer than the flower cup.

Fruits shining, up to seven in a cluster, egg-shaped, slightly angled.

The Shining Gum is found in Victoria near Mount Baw Baw and similar localities.

As already stated, the Shining Gum is closely related to the Mountain Gum (*Eucalyptus goniocalyx*). The differences which separate the two species are—

1. The Shining Gum attains a size never attained by the Mountain Gum.

2. The timber of the former species appears to be fuller in the grain, less interlocked and less durable than that of the Mountain Gum.

3. The young branchlets of the Mountain Gum (*E. goniocalyx*) do not appear to be winged at any time, as in the species here described.

4. The fruits of the Shining Gum (*E. nitens*) are much smaller and shinier than those of the Mountain Gum (*E. goniocalyx*).

In regard to nectar and pollen production no distinct and separate information is available, as the Shining Gum has so far not been distinguished as a distinct species by apiarists.

THE YERTCHUK (*Eucalyptus Consideniana*, Maiden)

(Fig. 55.)

A medium-sized tree, with a grey tough bark of the character well known as "peppermint," very like that of the Peppermint Gum (*E. piperita*, Sm.), but very different from that of the Silver Top (*E. Sieberiana*, F. v. M.), in the company of which it often grows. In Gippsland it seems more of a Stringybark, with rough bark (as in other locations) right to the tips of the branches. It grows most freely upon the rather poor sandy and clay lands of the coastal country of Eastern Victoria, ascending also the coast ranges.

Yertchuk is the aboriginal name of this tree, which is also known as Peppermint, Messmate, and White Mahogany.

The leaves of mature trees are commonly broad lance-shaped, unevensided, and somewhat curved; up to 9 inches in length and nearly 2 inches in width; rather thick in texture. Colour equally green on both sides, dull or shiny, blue-green or bright sap-green. Veins of

Fig. 55.—The Yertchuk (*Eucalyptus Consideneana*, Maiden).

leaves strongly marked, spreading from the base, the marginal vein a considerable distance from the edge. Leaves mostly hanging straight down.

Juvenile leaves (sucker and seedling leaves) narrow lance-shaped, opposite but soon becoming alternate. They are narrower than those of the Silvertop (*E. Sieberiana*, F. v. M.), and of the Peppermint Gum

(*E. piperita*. Sm.) to both of which the Yertchuk (*E. Consideneana*) is closely related and possibly a hybrid of these two species. The *sucker leaves of the Yertchuk are of a rather strong peppermint* odour and often of silvery appearance. The young branchlets and seedling stems are angular.

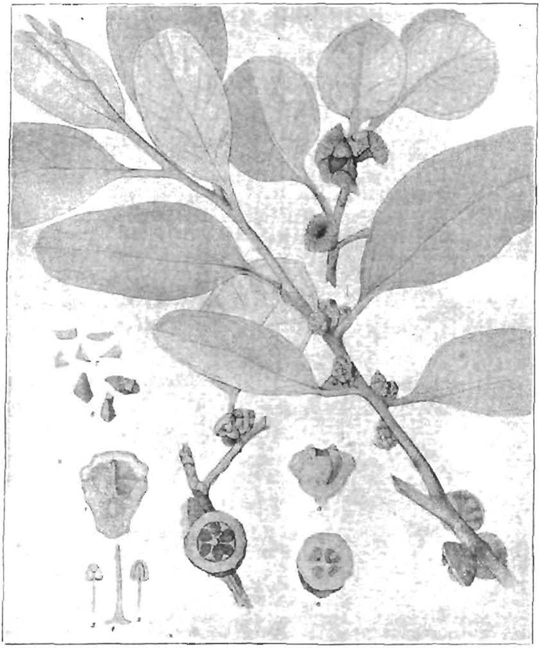


Fig. 56.—The Grampians Gum (*Eucalyptus alpina*, Lindley).

The flower clusters have numerous buds, with the typical form of the Narrow-leaved Peppermint (*E. amygdalina*), to which also the shape of the bud and the depressed lid belong, which, however, in the Yertchuk is sometimes pointed.

The fruits are generally pear-shaped, often nearly conical, rather *more than ½-inch in diameter. The rim of the fruit broad, smooth,*

well defined, and usually red in colour; it is somewhat like that of the Brown Messmate (*E. haemastoma*), but the latter is a gum, or smooth-barked species.

This species can be most conveniently distinguished by its pear-shaped fruits and peppermint bark, its narrow sucker leaves are also characteristic.

The timber is pale-coloured, with gum rings, remarkably like that of the Peppermint Gum (*E. piperita.* Sm.). It is soft and stringy, not nearly so good as that of the Silvertop (*E. Sieberiana.* F. v. M.).

Nothing is yet known of the value of the Yertchuk to the apiarist.

The Grampians Gum (*Eucalyptus alpina.* Linde.)

(Fig. 56.)

A dwarf eucalypt of no economic value, and remarkable for being confined to a restricted area in the Grampians, where it is found at an elevation of over 3,000 feet.

It was discovered by Colonel Sir Thomas Mitchell, when that eminent explorer discovered the Grampians, and ascended, in July, 1836, the mountain now known as Mount William.

It is probably the slowest growing of our eucalypts, which is quite remarkable, because its nearest systematic relative is the Blue Gum (*E. globulus*), our fastest growing tree, which it much resembles in its warty buds and fruits.

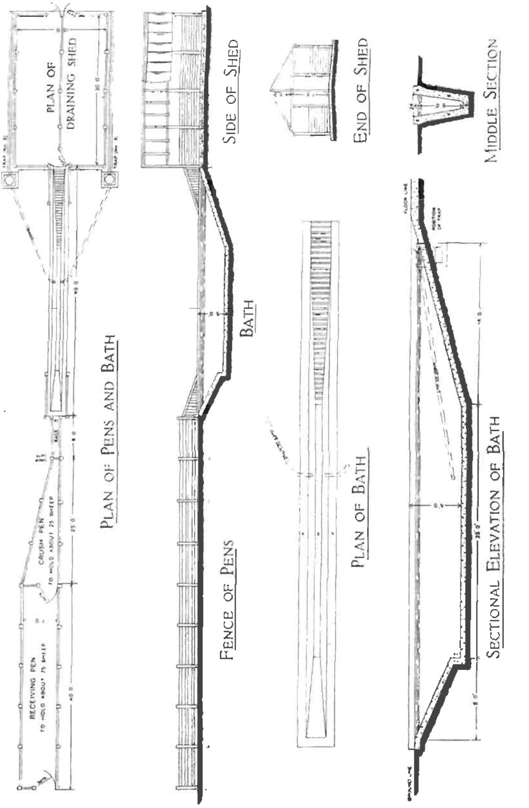
(To be continued.)

My own experience, says a correspondent in an agricultural paper, is that the son of a small farmer is invariably an all-round man, able to milk, plough, tend cattle, and so on, whilst the son of the agricultural labourer "follows father's footsteps"—and, like the father, is a one-job man. The factor of personal attention, then, is worth a lot in the handling of dairy cows, and worth much more in the raising of calves, another feature of farming to which the small man should give more attention. "Who feeds the calves?" I recently asked the owner of as bonny a lot of chubby youngsters as I have ever seen. The answer was just as I expected: "The same one who feeds the babies." Nobody like a woman for looking after a calf, or anything young, especially when the woman, as in the case quoted, "owns the man who owns the calves." Just when a man has got tired of tending a delicate calf, and bids it good-night with a fervent heart-wish that it will be dead in the morning, is the time when the woman lends her helping hand. It is a remarkable thing that amongst small farmers in Ireland "the woman of the house" makes herself responsible for the health and comfort of the calves; while "himself" looks to almost everything else except the hens.

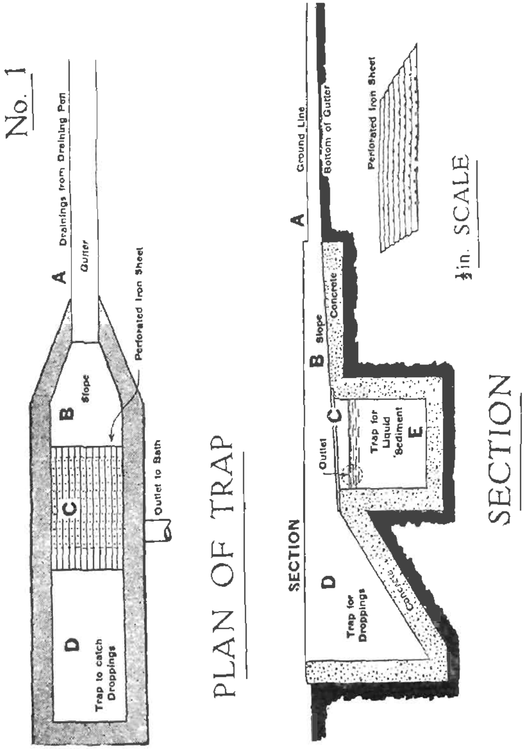
A SHEEP DIP.

By A. W. Curlewis, Inspector of Stock.

In connexion with plans and descriptions of sheep dips which appeared in *Journal of Agriculture* for July last, a further complete set of plans and details of material required, &c., of a "walk in" dip,



forwarded to the Director of Agriculture by Messrs. Cooper and Nephews, 544 Collins-street, Melbourne, is now submitted for insertion in this issue.

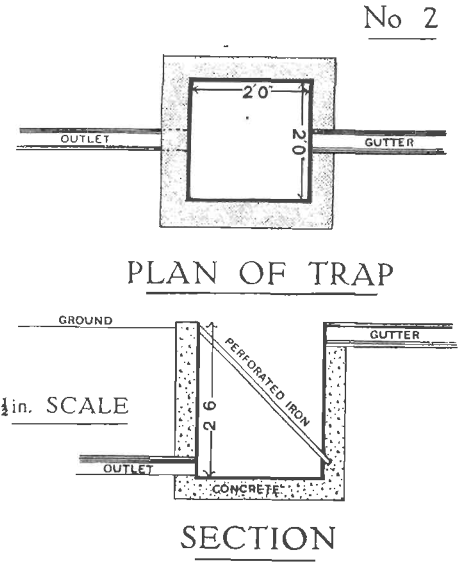


Acknowledgment must also be made to the same firm for plans of dips shown in Figs. 1 and 5 of the above-mentioned article.

The "walk in" has not so far been generally used in this State, and there is a diversity of opinion on the part of sheep-owners regarding its merits.

I concur in the view expressed by Messrs. Cooper and Nephews as to its being the most humane method of dipping; and, provided the sheep took the swim kindly, without undue forcing in starting them, much labour and vexation to all concerned would frequently be avoided.

In dipping sheep which have already been through the operation, especially old ewes, there is always a difficulty in getting them into and then along the race leading to the bath; this obtains more or less in any dip; but in slide dips, which are most common, they arrive at the point



where they can resist no longer before they are beyond reach of a "penner" leaning over the low fence of the race.

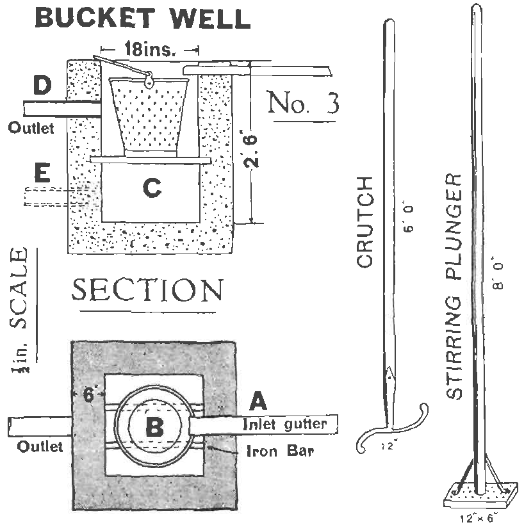
It would be interesting to get definite information as to whether sheep dipped only in "walk in" dips from the time they were lambs dread the operation less than they appear to do after being put through the ordinary dip. It seems quite possible that sheep going through without much forcing, and minus the shock of the sudden involuntary plunge, might face the ordeal in subsequent years with less fear.

When opportunity occurs further particulars will be obtained on the matter and given to readers of these columns.

MATERIALS REQUIRED.

FOR CONCRETE—Broken stone, 6 parts.
Clean sand, 2 parts.
Cement, 1 part.

FOR CEMENT PLASTER—Clean sand, 2 parts.
Cement, 1 part.



PLAN OF TRAP

QUANTITIES REQUIRED.

FOR CONCRETE 6 INCHES THICK—
For Bath—10 cubic yards, broken stone or gravel.
3½ cubic yards clean sand.
11 casks or 33 bags cement.

PLASTER, ½-INCH THICK (AREA, 58 SQ. YARDS)—Clean sand, 16 cubic feet.
Cement, 2 casks or 6 bags.

CONCRETE, 6 INCHES THICK—

For Draining Floor—12 cubic yards broken stone or gravel.
4 cubic yards clean sand.
13½ casks or 40 bags cement.

PLASTER ½-INCH THICK—(AREA 75 SQ. YARDS)—20 cubic feet or , cubic yard sand
2½ casks or 7½ bags cement

TOTAL QUANTITIES.

Broken stone or gravel, 22 cubic yards; sand, 9 cubic yards; cement, 29 casks or 87 bags.

MATERIALS FOR DRAINING SHED.

14 Side posts, 11-ft., 4 x 3
5 Centre posts, 14-ft., 4 x 3
26 Rafters, 10-ft., 3 x 2
1 Ridge, 30-ft., 4 x 1½
3 Beams, 18 ft. 6 in., 3 x 2
8 Roof battens, 30-ft., 3 x 1
8 Side battens, 30-ft., 3 x 1½
8 End battens, 8-ft., 3 x 1½
8 End battens, 7-ft., 3 x 1½
34 Sheets 10-ft. iron.
6 Lengths 14-in. ridge cap.
Wings—4 11-ft. and 4 9-ft., 3 x 2 (Splash boards at each end of bath)
60 feet super. 6 x 1 board.

FOR GATES—24 feet 3 x 2, 48 feet 3 x 1, and 3 pairs 18-in. tee hinges.

"NATALITE," A MOTOR FUEL CONSISTING OF ALCOHOL AND ETHER, MADE FROM MOLASSES.

Attempts to use alcohol as a substitute for petrol or gasoline in the internal combustion engine have been numerous, but certain difficulties—the necessity for high compression in the cylinder, the difficulty to start the motor "from cold," &c.—have thus far stood in the way of a general adoption of the practice.

A motor fuel, recently invented and patented and to which the name of "Natalite" has been given, is said to overcome the difficulty attendant upon the use of alcohol alone, by mixing with the alcohol ether obtainable by the distillation of alcohol with sulphuric acid.

A report made in June, 1915, by Professor Vivian B. Lewes, Chief Superintending Gas Examiner of the Corporation of the City of London, has been summarized in a recent issue of the *International Sugar Journal* (Vol. 18, 1916, p. 32).

In concluding his report, Professor Lewes said:—"The great value of 'Natalite' lies in the fact that alcohol can be made on an enormous scale in every quarter of the world, while the alcohol so made can be caused to give the necessary ether by further distillation with sulphuric acid, and the cost at which the finished spirit could be put upon the market would be considerably below the price of the cheapest petrol.

"There is not the least doubt that, given the required facilities, 'Natalite' would prove a motive fuel of the greatest Imperial importance."

—*Pure Products*, July, 1916.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917.

Commenced 15th April, 1916; concluding 14th April, 1917.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.9.16	15.9.16 to 14.10.16	Total to Date (Six months).	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
1	G. McDonnell	White Leghorns ..	620	152	772	1
10	J. H. Duncan	,, ..	607	153	760	2
13	H. J. Meaddows ..	.. ..	604	147	751	3
25	A. H. Mould	.. ..	595	145	740	4
36	E. W. Hippe	.. ..	586	144	730	5
7	C. J. Jackson	.. ..	600	128	728	6
40	A. Brundrett	.. ..	590	126	716	7
41	Excelsior Poultry Farm ..	.. ..	576	138	714	8
38	V. Little	.. ..	564	146	710	9
37	J. M. Smith	.. ..	557	150	707	10
22	Mrs. H. Stevenson ..	.. ..	574	132	706	11
28	S. Cheatle	R.C.B. Leghorns ..	556	134	690	12
15	G. Laughlan	White Leghorns ..	545	142	687	13
3	W. M. Bayles	.. ..	537	150	687	14
17	W. G. Swift ..	.. ..	552	133	685	15
44	J. Jamieson . ..	.. ..	540	145	685	16
27	John Blacker . ..	.. ..	574	105	679	17
24	Mrs. H. N. H. Mirams ..	.. (5 birds)	561	105	666	18
45	C. H. Oliver . ..	.. ..	530	131	661	19
14	W. R. Hustler . ..	.. ..	523	133	656	20
23	T. A. Pettigrove ..	.. ..	530	124	654	21
32	N. Burston . ..	.. ..	499	149	648	22
30	F. T. Denner	.. ..	514	122	636	23*
39	L. McLean	.. ..	499	137	636	23*
34	F. G. Silbereisen ..	.. ..	502	130	632	25
18	C. Ludwig	. ..	502	128	630	26
12	G. Hayman . ..	. ..	478	146	624	27
11	R. W. Pope . ..	.. ..	472	149	621	28
6	J. J. West	.. ..	486	133	619	29
16	F. Collings	.. ..	484	133	617	30
29	A. S. Hyndman ..	.. ..	465	149	614	31
26	Mrs. A. Dumas	. (5 birds)	476	126	602	32
8	E. A. Lawson . ..	.. ..	450	151	601	33
43	S. Buscumb . ..	.. ..	447	150	597	34
101	A. E. Silbereisen ..	.. ..	452	143	595	35
19	Benwerren Egg Farm ..	. ..	430	132	562	36
5	W. G. Osburne	.. ..	408	118	526	37
35	*Tom Fisher*	. .	363	130	493	38*
20	H. L. Merrick	.. ..	362	131	493	38*
33	E. F. Evans . ..	.. ..	348	136	484	40
9	W. H. Clingin . ..	.. ..	353	129	482	41
4	Fulham Park	,, ..	290	140	430	42
31	J. H. Gill . ..	,, ..	262	146	408	43
		Total ..	21,463	5,880	27,343	
		HEAVY BREEDS.				
		DRY MASH.				
98	Marville Poultry Farm ..	Black Orpingtons ..	670	125	795	1
97	D. Fisher .. .	.. ..	621	115	736	2
100	Oaklands Poultry Farm ..	,, ..	611	123	734	3
94	Mrs. H. Coad	.. ..	515	104	619	4*
95	Mrs. T. W. Pearce ..	. ..	484	135	619	4*
96	H. Hunt	,, ..	418	124	542	6
99	J. Ogden	,, ..	313	84	397	7
		Total ..	3,632	810	4,442	

* Tie: on the page, the shared position is printed once against a brace spanning both entries.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916–1917—*continued.*

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.9.16	15.9.16 to 14.10.16	Total to Date (Six months).	Position in Competition.
	LIGHT BREEDS.					
	DRY MASH.					
46	W. H. Robbins ..	White Leghorns ..	702	138	840	1
52	W. J. Thom	" ..	653	161	814	2
59	T. A. Pettigrove ..	" ..	675	135	810	3
53	W. N. O'Mullane ..	" ..	616	154	770	4
58	C. Ludwig	" ..	593	151	744	5
70	G. Wilkinson	" ..	602	141	743	6
56	Mrs. Nicoll	" ..	616	121	737	7
47	H. McKenzie and Son ..	" ..	585	151	736	8
54	Mrs. A. O. Hughes ..	" ..	566	152	718	9
65	Izard and Tierney ..	" ..	570	142	712	10
61	C. C. Dunn	" ..	573	123	696	11
62	H. W. Morrow	"	554	132	686	12
69	E. A. Lawson	" ..	505	152	657	13
55	Rev. J. Mayo	"	502	150	652	14
48	Thirkell and Smith ..	"	508	135	643	15
60	A. Greenhalgh	" ..	490	134	624	16
67	Lysbeth Poultry Farm ..	" ..	475	146	621	17
63	N. Burston	" ..	452	158	610	18
49	C. Lane	" ..	456	109	565	19
66	Benwerren Egg Farm ..	"	401	154	555	20
51	Reliable Poultry Farm ..	" ..	412	137	549	} 21
50	Clevedon Poultry Farm ..	" ..	409	140	549	} 21
64	A. Bennett	" ..	359	140	499	23
68	W. G. Osburne	" ..	311	141	452	24
		Total	12,585	3,397	15,982	
	HEAVY BREEDS					
	WET MASH.					
74	Oaklands Poultry Farm ..	Black Orpingtons ..	726	139	859	1
89	Brooklyn Poultry Farm ..	" ..	648	113	761	2
87	S. Buscumb	" ..	625	124	749	3
85	Mrs. M. Coad	" ..	609	124	733	4
92	J. H. Wright	" ..	610	110	720	5
86	C. Ludwig	" ..	597	119	716	6
80	Mrs. T. W. Pearce ..	" ..	597	108	705	7
88	A. D. McLean	" ..	579	123	702	8
83	L. McLean	" ..	598	92	690	9
90	Excelsior Poultry Farm ..	" ..	528	153	681	10
72	Marville Poultry Farm ..	" (5 birds)	556	95	651	11
91	N. Papayanui	" ..	506	143	649	} 12
93	L. W. Parker	" ..	548	101	649	} 12
78	Reliable Poultry Farm ..	" (4 birds)	503	134	637	14
77	Mrs. G. R. Bald ..	White Plymouth Rocks	467	122	589	15
81	K. Courtenay	Faverolles ..	443	122	565	16
84	H. L. Trevana	Rhode Island Reds	414	121	535	17
71	C. E. Graham	Black Orpingtons ..	397	135	532	18
73	E. W. Hippe	Rhode Island Reds	411	102	513	19
76	L. A. Errey	Silver Wyandottes	392	119	511	20
82	J. Ogden	Black Orpingtons ..	340	129	469	21
75	Mrs. Drake	Rhode Island Reds	324	103	427	22
		Total ..	11,412	2,631	14,043	

REPORT.

The past month has been very trying for the birds, chiefly on account of the extremely heavy rainfall. For many days in succession heavy rain fell almost incessantly.

Broodies were very numerous during the month, up to 45 in one week.

The results may be considered satisfactory, in view of the unprecedented conditions, and with better weather the birds are now scoring well.

Rainfall, 824 points.

Temperatures: Lowest, 44 deg. Fahr.: highest, 78 deg. Fahr.

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

SPRAYING.

The spray pump should now be in thorough working order, so that the various spring sprayings may be carried out with as little interruption as possible. It is always wise to clean out the pump after each spraying, so that it will be ready for the next mixture. Putting a different spray in a pump barrel that has not been washed out very often causes the formation of a sediment, which blocks the nozzle and interrupts the work.

During November it will be necessary to spray for codlin moth, peach aphis, pear slug, and various leaf-eating insects. In addition, black spot of the apple and pear, shot hole, and other fungus diseases must be kept in check. Various sprays are required for all of these troubles, and the necessity of always having a clean pump will thus be admitted.

At the present time the wisest spray for peach aphis will be strong tobacco solution, and the same spray may also be used for the pear slug. Arsenate of lead is the better spray for this insect, but it should not be used when the fruit is approaching the ripening stage; hellebore may also be used for the slug with good effect.

As a preventive against codlin moth, the trees should be kept well sprayed with arsenate of lead. If the spraying is careful and thorough, no bandaging need be carried out. The time spent in bandaging will be far better employed in an extra spraying. The first spraying should have been given at the time of the falling of the petals; the second spraying, owing to the rapid expansion of the fruit, should be given a fortnight later. After that the grower must use his own judgment as to the necessity for subsequent sprayings. If the moths be at all prevalent, other sprayings will be quickly necessary.

As the woolly aphis is increasing at this time of the year, it will mean a saving of a good number of buds if this insect is sprayed. Nicotine solution, pine spray, or lime sulphur may be used with good effect.

Cultivation.

The work of ploughing and harrowing should be completed immediately. All crops for green manure should be now under cover, and if the orchard soil is at all heavy or stiff, the grower should make up his *mind to grow a cover crop next season, in order that this condition may* be reduced.

The orchard should be kept free from weeds, not only for the conservation of moisture, but in order to do away with all hiding places of the Rutherglen fly, cutworm moths, &c.

General Work.

Grafted and newly-planted trees should be frequently examined, and given an occasional watering and overhead spraying, in order to encourage their growth, and to prevent loss of moisture from the foliage. It is also advisable to mulch young trees with light grass or straw mulching, not too rich in animal manure.

The disbudding of unnecessary shoots and the pinching back or stopping of growths, to prevent them from being unduly prolonged, may now be carried out. This work is particularly important on young trees.

Graft ties should be examined, and the ties cut wherever any growth is being made. Where the grafts are likely to make any long growth, they should be well staked and tied.

Citrus trees may be planted out, watering and mulching them after planting.

Vegetable Garden.

Tomato plants should now receive attention every day; laterals will require pinching back, crowded bunches and shoots should be thinned, the plants should be well tied to the stakes, and liberal supplies of water and manure should be given. One or two more plantings of tomato plants may still be made, so that there may be strong, sturdy plants for the production of late fruits. By planting three or four successions of plants, it is possible to have a good supply of fruits from December to June.

Celery may now be sown for winter crops. French beans should be largely sown. Cucumber, melon, pumpkin, and all seeds of this family may now be sown in the open.

Where these plants are already growing, the longest and strongest runners may be pinched back, to throw the strength into flowering and lateral growths. Watch the plants for mildew, and use sulphur freely wherever present, especially on the young plants.

Peas, lettuce, radish, turnip, cabbage, and sweet corn seeds may be sown this month. Seedlings from former sowings may be planted out, and it may be well to dip the whole plant in water before planting. This greatly assists the young plants while taking hold of the soil in their new location.

Frequent waterings and frequent cultivation will now be necessary, and all weeds must be hoed or hand-weeded out; mulching with stable manure will greatly assist the plants.

A few beds should now be deeply worked, adding a liberal dressing of stable manure. These plots will then be ready for the celery, cabbage, and other seeds planted during this month.

Flower Garden.

Continue to plant out the various bedding and foliage plants, corms of gladioli, tubers of dahlias, and seed of such tender annuals as phlox Drummondi, balsam, zinnia, nasturtium, celosia, aster, cosmos, and portulaca.

While seeds germinate and grow fairly well planted out in the open, it is more advisable during the summer months to plant these in sheltered seed beds, or in a canvas or calico frame. The protection need only be on the one side, preferably the west or north-west; the seedlings are then protected during the hottest part of the day. At the same time the shading should not be sufficient to unduly "draw" them.

The seeds must not be deeply sown, and all waterings should be light. A little water, often, should be the rule for seedlings. Annuals require plenty of room when planted out in the garden. Being quick growers, they are generally gross feeders, and they must have room to develop a good root system. Feeding, too, with liquid manure is helpful when they are reaching the flowering stage.

Dahlias should now be planted out, either from tubers or from young rooted cuttings. These will give good summer blooms. For autumn and show blooms, the planting should be deferred until the middle of December.

Herbaceous and succulent plants should be staked for protection; included in this section are delphinium, gladiolus, perennial phlox, rudbeckia, &c. These plants will all benefit from liberal mulchings and watering with liquid manure when approaching the blooming period. Spring flowering bulbs, corms, and tubers should now be lifted and stored.

The soil surfaces will now benefit from frequent hoeings and stirrings. Constant waterings will be required if the weather be hot or windy; the cultivation should quickly follow the waterings in order that the moisture may be thoroughly conserved. Mulching with stable manure is also beneficial at this season.

REMINDERS FOR DECEMBER.

LIVE STOCK.

HORSES.—*Stabled Horses.*—Over-stimulating and fattening foods should be avoided. Give water at frequent intervals. Rub down on coming into the stables overheated. Supply a ration of greenstuff, if available, to all horses, or bran mash once a week with 3 or 4 packets of Epsom salts. *Brood Mares.*—Those with foals at foot should be well fed. *Early Foals* may, with advantage, be given oats to the extent of 1 lb. for each month of age daily. Examine the region of the jaws, neck and forelegs for eggs or nits of bot-flies. If present destroy by running a singeing lamp lightly and rapidly over the affected regions.

CATTLE.—Provide succulent fodder and plenty of clean water and shade. Limewash the cowbails, it helps to keep down flies. Provide "lick" in trough, consisting of salt 20 lbs., bone meal 20 lbs., and sulphate of iron, ½ lb. Look out

for milk fever. Read up method of treatment in *Year-Book of Agriculture*, June, 1905. Have cows tested for butter-fat and weighed. Rear heifer calves from cows giving satisfactory results. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give *too much milk at a time for the same reason. Give half-a-cup of limewater in* the milk to each calf. Let them have a good grass run or lucerne, or ½ lb. crushed oats each per day in trough. Dehorn all dairy calves, except those required for stud or show purposes.

PIGS.—*Sows.*—Supply those farrowing with plenty of short bedding in well-ventilated sties. Those with litters old enough may be turned into grass run. *All* pigs should be given a plentiful supply of clean water. Read articles on breeding and feeding in *Journals* for April, 1912, June, 1913, and May, 1915 Pig raising and fattening with present price of pollard and bacon should be highly profitable.

SHEEP.—Mate all ewes procurable. Where ewe lambs are held for future breeding see that the cross will result in bulky medium grade, good style fleeces as well as a roomy carcass. Allow rams to remain with the ewes seven weeks, this period admitting of any ewes coming in season the second time. It is rarely necessary to join more than 3 per cent. of 2 tooths, 3 per cent. of 5 and 6 year olds, or 2 per cent. of 2, 3 and 4 year old rams, unless with young ewes. If conditions justify it, 3 and 4 per cent. of vigorous matured rams with aged coarse crossbred ewes will bring an increased number of twin lambs. Clear wool and burrs from about the pizzles of rams, and cut hoofs into shape before mating. Ewes should be of one breed or as near one cross as possible to ensure an even and rapid dropping. Merino and fine cross ewes are in season earliest, first cross or half-breds later, and all ewes with a preponderance of British blood later still. Ewes carry their lambs, four months, four weeks, four days, or roughly, five months.

POULTRY.—Add a little peameal to morning mash and give less bran. Feed equal parts wheat and heavy oats at night. Supply plenty of green food—at this time, lettuce is invaluable. Discontinue salts and condiments. Avoid salt meat of any description. Put Douglas mixture in drinking water when required. Keep ample supplies of sand, ashes, &c., in pens, and moisten same. This will enable the birds to keep themselves cool and clean. Top off geese, ducks, and cockerels for the Christmas markets. Hens will do better this month by having free range. Remove all male birds from flocks, as infertile eggs will keep longer and command a higher price.

CULTIVATION.

FARM.—Cut hay in late districts. Cut oats and barley in early places. Finish planting potatoes. Put in late maize for fodder, also millet and imphee. Plough fire-breaks where required. Get stackyard and stages ready for hay.

ORCHARD.—Keep the surface loose and free. Suppress weeds. Spray as often as necessary for codlin moth and pear slug. Mulch and spray young trees and grafts with water in the early morning during hot weather.

VEGETABLE GARDEN.—Keep the surface hoed, and allow the plants plenty of moisture. Stake, pinch out, manure, and water tomatoes. Pinch back long runners of pumpkin and melon family. Sow autumn and winter varieties of cabbage and cauliflower. Plant out seedlings in cool weather. Sow French beans. Cease cutting asparagus beds, and top-dress with manure.

FLOWER GARDEN.—Plant out dahlias and gladioli for autumn blooming. Lift and store spring flowering bulbs. Stake, tie, and train growing plants. Sow zinnias and asters. Layer carnations, camelias, daphnes, &c. Water well and keep the surface loose. Keep rose beds fairly dry.

VINEYARD.—Inspect young grafted vines (field or bench) and carefully remove any scion roots. Tie up young vines. Beware of cut worms on young vines—See *Journals* for July, 1911, and September, 1913. Tying up of bearing vines, if practised, should be completed early in month. Avoid excessive and indiscriminate topping, far too frequent in Victoria. Scarify, if soil is not sufficiently loose, and after heavy rain. Look out for oidium and repeat sulphurings on first appearance of disease.

Cellar.—Fill up regularly and keep cellars as cool as possible.

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FRUIT PROSPECTS, 1916-17.

By P. J. Carmody, Chief Orchard Supervisor.

Unfortunately the prospects for the fruit crop for the coming season are anything but promising. The enormous crop of last year to a certain extent weakened the trees, and even under the best weather conditions a heavy yield could not be expected.

The unfavorable weather throughout the blooming period no doubt is the principal cause of the poor setting. While the mid-season apples were in bloom there were only two fine days in some of the largest apple districts. Under these conditions insect activity was at a minimum, and there was but little dissemination of pollen throughout the orchards through the influence of winds, so that one could but expect a very light setting of fruit.

Peaches and pears seem to have set satisfactorily in most districts, but all other fruits are considerably below normal yields.

It will be necessary to take precautions against the pests so as to secure the crop that is now in sight.

The Black Spot threatens to be bad, as when the time of spraying occurred the weather was so bad that it could not be carried out. It will, therefore, be advisable to give a spraying of lime and sulphur at a strength of about 1 in 30 as soon as possible to prevent this extending.

Subjoined are the reports of the orchard supervisors in their respective districts:—

Prospects of fruit crop for season 1916-17 in the district which comprises the following places:—Arthur's Creek, Cottle's Bridge, Diamond Creek, Doreen, Eltham, Greensborough, Hurstbridge, Kangaroo Ground, Kinglake, Keilor, Panton Hill, Queenstown, Research,

15013.

Streamville, Strathewen, Tanck's Corner, Wallan, Whittlesea. E. Wallis, Orchard Supervisor—

Apples.—Light.

Apricots.—Not grown to any extent, except at Keilor, where crop promises to be medium.

Cherries.—Medium.

Peaches.—Heavy.

Pears.—Medium to heavy at majority of places. Setting of some varieties interfered with by rain.

Plums.—Medium to heavy.

Quinces.—Medium to heavy.

Prospects of fruit crop for season 1916-17, in the Doncaster district. A. H. Hammond, Orchard Supervisor—

Apples.—Very light. Old trees that bore heavily last season have little or nothing on this season. Young trees and trees that were thinned and irrigated are carrying a light to medium crop. Taking the district as a whole, the apple crop will not be more than 15 to 20 per cent. of last season's crop.

Apricots.—Medium. Not largely grown.

Cherries.—Light. The early cherries are patchy; some orchards have a very fair crop, others very poor. Mid-season cherries are mostly a failure. Late cherries are also very poor. I should judge that the crop will not be more than 15 per cent. of the normal yield.

Peaches.—Very good. All varieties are carrying a heavy crop, and will require thinning.

Pears.—Heavy. All leading varieties have set a heavy crop. Owing, however, to the Black Spot (Fusicladium), the quantity of marketable fruit will not be more than normal, and perhaps less. Much depends on the efforts now being made to cope with the disease.

Plums.—Light. The crop of plums is very poor. Japanese plums in the Wandin district are medium; Angelina and Black Diamond are patchy. The plum crop, like the cherry, was spoiled by the continuous heavy rain when in full bloom.

Quinces.—Medium.

Prospects of fruit crop for season 1916-17 in the Evelyn and Central districts. J. Farrell, Orchard Supervisor.

Owing to the continual heavy rains, accompanied by low temperatures, which prevailed during the period in which the trees were in bloom, it is estimated that the crops of large fruits particularly, except pears, will be considerably below the average.

Apples.—Of the early blooming varieties Jonathan shows best; even then the crop will be light. The late blooming varieties—Five Crown and Rome Beauty, &c.—look well in places, but they are not setting as well as might be expected.

Pears.—Williams' Bon Chretien, medium to heavy; Howell, Beurre Bosc, Beurre Capiaumont, Vicar of Winkfield, medium; others, medium to light.

Plums.—All varieties light to very light, even the Japanese, which usually set well.

Cherries.—Early varieties very light; late sorts light.

Apricots.—Oullin's Early and Moorpark, medium; others, medium to light.

Peaches.—In some parts of the district all kinds a fair crop; in others, medium to light.

Quinces.—Mostly light.

Figs.—First crop light.

Passion Fruit.—Although the vines do not look as well as they usually do at this time of the year, a good crop is in evidence.

Loquats.—Very light.

Lemons.—Medium.

Oranges.—Medium to light.

Gooseberries.—Medium to light, even the Roaring Lion, which usually yields so well.

Currants.—White, light; black, medium.

Raspberries.—It is rather early to estimate, but as the canes look well, and in the absence of thrip, a medium crop may be expected.

Loganberries.—These look very well, and will probably yield a good crop.

Blackberries.—Calculation on the same basis as for Raspberries and Loganberries.

Strawberries.—The weather has been too wet and cold for the plants to properly develop their blooms. In all probability there will be a fair crop, but it will be later than usual.

Prospects of fruit crop for season 1916-17 in the districts mentioned below. A. G. McCalman, Orchard Supervisor—

Geelong District.

Apples will be a light crop. Jonathans in many cases failed to bloom, and where there was bloom did not set well. Reinette de Canada, Stewart's Seedling, Granny Smith, and Munro will be on the light side. Delicious, Dumelow Seedling, Thorle Pippin, Yates' Seedling, Emperor Alexander, and Shockley will be light. King David failed to bloom. Sturmers are setting well, and so is Cleopatra. Æsopus Spitzenburg is a failure.

Apricots will be on the light side; only a few orchards which were irrigated last season, or where the crop failed from frost, show a heavy setting. Moorpark and Mansfield Seedling will be medium to light, and Turkey very light.

Plums.—Nearly all varieties of plums have set very light crops, the weather at the time of blooming being very unfavorable, besides which the bulk of the trees bore very heavy crops last season.

Cherries.—Early varieties will have a medium crop, but St. Margarets and Florence will be very light.

Pears.—Most varieties, including Williams', Black Achan, Beurre de Capiaumont, Josephine de Malines, Winter Cole, and Beurre Clairgeau have set good crops.

Quinces and Gooseberries have set fair crops.

Peaches.—All varieties have set well.

Mt. Cole District.

Apples will be a light crop. London Pippin, Rokewood, Stone Pippin, and Munro are a failure; Jonathan and Rome Beauty and other varieties are light.

Pears, including Williams', Vicar of Winkfield, and Josephine de Malines will be light.

Apricots are very light, and *Peaches* will be a failure from frost.

Cherries will be a medium crop.

Colac District.

Apples will be a light crop. Rome Beauty promise well, but most varieties will be light.

Pears will be a good crop, Williams', Kieffer's Hybrid, and Packham's Triumph showing well for fruit.

Plums will be a medium crop, and early *Cherries* fair.

Currants and Gooseberries will be light, and *Raspberries* fair.

Rokewood Junction District.

Apples will be light. Rokewood is very light; Jonathan, light. Northern Spy, Sturmer, and Cleopatra promise well, as do Rymer, Hoover, and London Pippin. Dumelow and Spitzenburg are a failure.

Pears, including Williams', Kieffer, Vicar of Winkfield, and Josephine will be a good crop.

Early *Cherries* are good, but late kinds light. About Linton both early and later varieties of cherries set well.

Ballarat District.

About Buninyong Cherries will be a light crop, but Early Purple Guigne set well, and Bedford's Prolific set a fair crop. St. Margaret and Florence are very light. Apples will be very light, though Rymer's are fair and Rome Beauty promise well. Plums and Quinces are fair, and Gooseberries light. Raspberries promise well.

PANMURE DISTRICT.

Apples are a light crop. Most of the Cleopatras failed to bloom. Jonathans are light, but Rome Beauty promises well.

Pears, including Williams', Kieffer's, Beurre de Capiaumont, Marie Louise, Josephine, Vicar of Winkfield, and Gansell's Bergamot set heavily.

Cherries are heavy.

Plums did not bloom well and set badly, so will be very light.

SUMMARY.—Apples will be light. Apricots, medium. Pears, fairly heavy. Cherries, light. Plums, very light. Peaches, heavy. Quinces, fair. Gooseberries, fair. Raspberries and Currants, fair.

Prospects of fruit crop for season 1916-17 in the Gippsland district. L. Pilloud, Orchard Supervisor—

The apple crop is very light in orchards inspected at Beaconsfield, Officer, Pakenham, Gembrook, Garfield, Nar-Nar-Goon, Drouin, Warragul, Rokeby, Darnum, Yarragon, Cowwarr, and Bairnsdale. Jonathans, Yates, Sturmers, Rymers, London Pippins, and Rome Beauty are very light. All other varieties set, only a few here and there.

Pears.—Williams', Kieffer Hybrid, Josephine, Gansell's Bergamot, heavy crop; other kinds, light.

Plums.—Good all over district.

Cherries.—Good.

Quinces.—Very light.

Apricots.—Good crop.

Peaches.—Good crop at Bairnsdale, Bruthen, Cowwarr, Warragul, and Drouin.

Prospects of fruit crop for season 1916-17 in the Goulburn Valley district. G. M. Fletcher, Orchard Supervisor—

Peaches.—All varieties of both canning and dessert promise a heavy crop in all parts of the district.

Apricots.—Young, vigorous trees show good crops, but the old trees are very light. Shot Hole has made havoc with the old trees, and thinned the crop very severely. Owing to the excessively wet season only a minimum of spraying could be done to combat the disease. In different parts of the district one variety is better than all the others, but in other districts other varieties show better. I estimate only a half crop, with no particular variety prominent.

Pears.—Williams' constitute the bulk of the trees grown. These blossomed during the wettest spell, and the setting is very light. Individual orchards at odd places show a good crop, but the whole will be very light. Winter Nelis are almost a complete failure. Gansell's, Josephine, and Bosc are only grown in comparatively small quantities. The crop from these is much better than that of the Williams'.

Nectarines.—All varieties very good.

Prunes and *Plums.*—Light and patchy.

Grapes promise a heavy crop.

Apples.—Few grown; crop patchy and light.

GENERAL.—Early and late blooming varieties of all fruits promise well. Any that bloomed in the wet spell of September are a failure. Black Spot is showing up in some vines, and if checked will not affect the crop. Irregularity or inconsistency is a big feature in all crops, except peaches, in all parts of the district. Neighbouring orchards show widely differing results in the same varieties.

Prospects of fruit crop for season 1916-17 in the following districts. W. P. Chalmers, Orchard Supervisor:—

HORSHAM, QUANTONG, RIVERSIDE.

Apples, light. Pears, good. Early Peaches, heavy. Late Peaches, good. Apricots, fair. Plums, good. Prunes, fair. Almonds, fair Cherries, light. Figs (first crop), fair. Grapes, heavy.

DAYLESFORD, CLUNES, TALBOT.

Apples, light. Pears, good. Plums, light. Gooseberries and Currants, fair.

AMPHITHEATRE, ELMHURST, EVERSLEY.

Apples, very light. Pears, light. Apricots, good. Plums, light.

DUNOLLY, BET BET, ST. ARNAUD.

Apples, good. Pears, heavy. Early Peaches, heavy. Late Peaches, good. Apricots, good. Plums, light. Almonds, light. Cherries, light. Figs (first crop), very good. Grapes, heavy.

STAWELL, POMONAL.

Apples, light Pears, heavy. Late Peaches, good. Apricots, light. Plums, light. Cherries, fair. Grapes, heavy.

Prospects of fruit crop for season 1916-17 in the Mildura district. G. H. B. Davidson, Orchard Supervisor—

Citrus.—Blossomed well, and there should be heavy crops of these, with the exception of the trees affected with the salt water.

Peaches.—There should be heavy crops both at Mildura and Merbein.

Apricots.—Early varieties good; others light in some blocks and fair in others. On the whole they are not as good as last year.

Pears.—Heavy in most of the blocks.

Plums.—Good. Prunes showing good crops.

Figs.—First crop fair.

Almonds.—Good.

Prospects of fruit crops, season 1916-17, in the North-Eastern district. C. F. Cole, Orchard Supervisor—

Peaches.—Throughout the district, heavy to medium.

Plums.—Most varieties, good average crop.

Apricots.—Light.

Almonds.—Medium.

Cherries.—Medium to light.

Figs promise to be a heavy to medium crop.

Quinces.—Medium to heavy.

Oranges and *Lemons* in most localities promise well.

Pears.—Medium to light in most districts. Williams' promise to be the heaviest cropper this season.

Apples.—Medium to light generally. Jonathans and Cleopatra heavy in places. In late districts Apples are blooming well, and promise a medium crop.

Prospects of fruit crop for season 1916-17 in the Northern district. S. A. Cock, Orchard Supervisor—

The fruit crop in the Northern district promises to be light. Owing to the abnormally wet season it is almost impossible at present to forecast the crop with any degree of accuracy. Taking the various centres of the district—Castlemaine, Bendigo, Echuca, and Swan Hill—the following will show how the crop is at present :-

Apples.—Light crop

Apricots.—Medium crop.

Almonds.—Heavy crop.

Cherries.—Medium crop.

Citrus Fruits.—Promise very heavy crop.

Figs.—Light crop.

Grapes.—Promise very heavy crop.

Pears.—Light to medium crop.

Peaches.—Medium crop.

Plums.—Medium to heavy crop.

Quinces.—Heavy crop.

Tomatoes.—Medium crop. Floods and heavy rain have proved disastrous to early crop.

Prospects of fruit crop for season 1916-17 in the Portland district. T. J. Smith—

Apricots.—Medium; not many grown.

Pears.—Principal varieties—Vicar, Williams' Bon Chretien, Black Achan, Josephine, Buerre Bosc, Capiaumont, Clairgeau, Broom Park—immensely heavy crop.

Apples.—Jonathan, Gravenstein, Munro's, Rome Beauty, Rokewood, Sturmer, Cleopatra, Stewart's, Stone Pip, Spy, Æsopus, Ben Davis, Five C., Alexander—in all cases these are very light to medium.

Prospects for fruit crop for season 1916-17, South-Eastern district. E. Meeking, Orchard Supervisor—

Apples.—Jonathan, the principal variety grown on the Mornington Peninsula and South-Eastern Gippsland, is, on the whole, from light to medium; in no one centre is there a heavy crop. Heavy rain at a critical time interfered with the setting, and it was also the off year for many trees. Reinette, very light; in some districts practically *nil*. Sturmer, medium to heavy. Pomme de Neige, very light. Statesman, light. London, light. Rome Beauty, light. Yates, light. Munro, medium. Alfriston, very light. Gravenstein, light. Stone Pippin, medium. Rokewood, light. Williams' Favourite, medium to heavy. Æsopus, medium to heavy.

Pears.—Williams' Bon Chretien, heavy. Kieffer's Hybrid, light to medium. Beurre de Capiaumont, light to medium. Broom Park, heavy. Beurre d'Anjou, light to medium. Beurre Clairgeau, light to medium. All other varieties, light to medium.

Apricots.—Moor Park, light to medium. All other varieties, light.

Plums.—All ordinary varieties, light to medium. All Japanese varieties, medium to heavy.

Cherries.—Light varieties, medium. Dark varieties, medium.

Strawberries.—All varieties, a full average crop.

Quinces.—All varieties, heavy.

Peaches.—All varieties, light.

"THE WORLD'S AMMONIA."

The world's annual production of sulphate of ammonia from ordinary sources before the war was approximately 1,200,000 tons. In the United Kingdom the consumption has increased from 50,000 tons in 1897 to 130,000 tons in 1915, an increase which is very largely attributable to the efforts of the Sulphate of Ammonia Association, and which is certainly reflected in the remarkably remunerative prices obtained. The exports in the same period increased from 153,000 tons to 205,000. These figures are taken from an article in the "Iron and Coal Trades' Review" by Mr. Bayley, who adds that these totals may appear somewhat insignificant in comparison with what is done in Germany. Before the war the consumption in Germany approached 500,000 tons. The future position of sulphate of ammonia seems to be more doubtful than hitherto, and Mr. Bayley suggests that renewed and novel effort should be made to stimulate consumption in the United Kingdom.

APPLE CULTURE IN VICTORIA.

(Continued from page 666.)

By J. Farrell, Orchard Supervisor.

Pruning Established Trees.

Now that the principles are shown under which the modern type of fruit tree may be established in accordance with the plans which are submitted for consideration, the pruner should carefully note all the details with a view to their future scientific application.

Owing to the varying conditions under which the pruner has to work, it is not suggested that in every instance the trees can be brought to the state of perfection depicted in the plan and side elevation.

The leader growths multiply freely when the tree is growing on rich land, whereas one on poor soil requires more careful and systematic nursing in order to obtain the progressive leader duplication required. To be successful in this regard, however, it is essential that the operator should have fixed in his mind at the start the plans of the type of tree he wishes to establish.

When weak two-year-old trees are planted out on poor soil, the head growths should be cut hard back to outer buds with a view to producing strong single leaders, as leader duplication is rarely obtainable during the first year after planting under the adverse conditions mentioned. When the strong single leaders desired have been secured in this manner they may be cut hard back to side buds at next pruning, after which, owing to root establishment supplemented by manuring and good cultivation, the two leaders desired from each cut will result.

Having strengthened up the crown or foundation of the branch system in this way the pruner may continue to duplicate the leaders until such time as the desired number are obtained, and as shown in the plan Plate 35.

The main objects of pruning a fruit tree are to stimulate root action, to produce and maintain the required number of well-selected and nicely-spaced leaders which should be clothed from the top to their base with the proper quantity of fruit spurs of good quality, and a liberal supply of light fruit-producing lateral growths on the varieties that require them. Regular systematic pruning also maintains an equilibrium of strength between the root and branch systems. The free access of sunlight and air to all parts of the tree and to the fruit is provided for. The tree's symmetrical appearance, stability, and uprightness through its leaders radiating from the crown at a suitable angle to the vertical is ensured. And finally, its pruning is simplified, spraying and fruit picking is facilitated, cultivation is cheapened, while the quantity of the fruit product is increased and its quality improved.

The Established Tree.

When a tree has received its annual winter pruning, from the time of planting until it is seven years old, and provided the plans laid down for the guidance of same have been followed as closely as the conditions

governing the growth of the particular variety will permit, it will in most cases have assumed the shape of the Emperor Alexander tree shown in Plate 38.

It will be observed that this tree was rather difficult to manage owing to the main arm on the left being stronger than the others. But the judicious cutting practised in its case eventually produced a well-

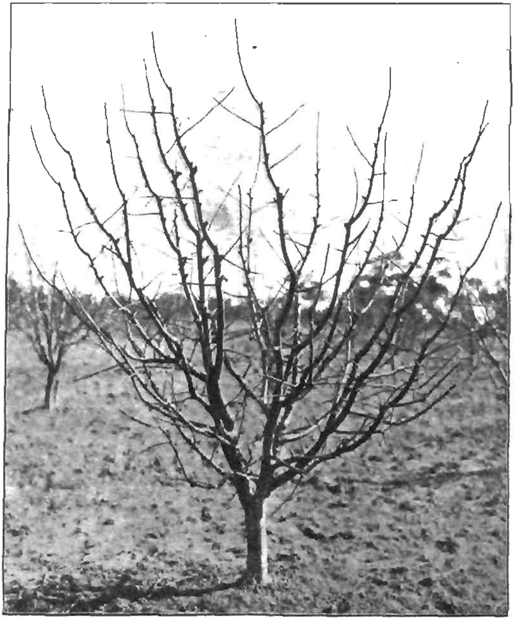

Plate 38.—Emperor Alexander, seven years old, and established on modern lines.

balanced branch system, and with its open centre and short stem this is a typical specimen of the modern apple tree.

It is growing on fairly deep, rich, well-drained and thoroughly cultivated silurian soil, and, as usually happens, when these favorable environments attend the growth of a tree, it is healthy, vigorous, thrifty, and of fruitful character.

After the desired number of leaders were obtained, no further duplication of same was permitted, and at the annual pruning the light laterals were retained to clothe the leaders with a desirable class of fruitful wood, while the stronger and less fruitful ones were completely suppressed.

The removal of the strong growths enables the fruit buds on the two-year-old wood of the leaders to extend into natural permanent fruit spurs, and when the light laterals have set up their fruit buds during the second year of their growth, they are shortened back to a few inches

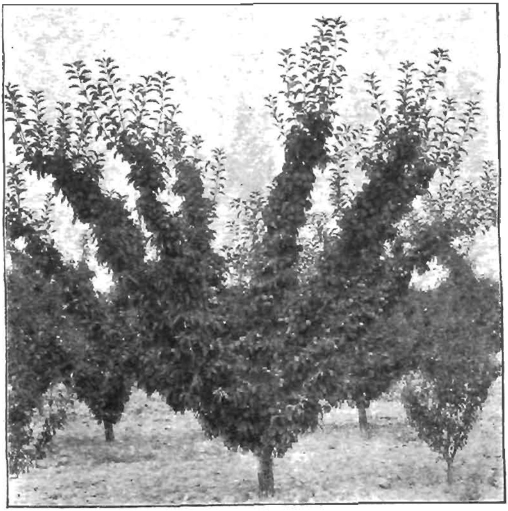

Plate 39.—Tree showing fruit on short growths along the leaders.

in length, and practically converted into strong artificial spurs to supplement the fruit bearing capacity of the natural ones.

The object of this treatment is to ultimately produce a tree which will carry its fruit on short growths along the leaders like that shown in Plate 39. At the next winter pruning all the strong young growths appearing at the points of the leaders of this tree as a result of last year's cuts should be removed except one in each case which is retained to continue the straight single leaders. The length at which these leader growths should be cut may be determined by the class of soil on

which the tree is growing and by the strength of the growths it is producing. Strong growths may be cut longer than the weaker ones. *As a guide in this matter, however, from a minimum of 6 inches to a* maximum of 12 inches may be observed as a standard, when a tree over seven years old is growing on soil of average fertility. When the tree is under seven years old and growing under similar conditions the standard may be raised somewhat when dealing with the leaders after the discontinuance of their duplication and until the tree has reached the age of seven years. When this open formation of the tree has been obtained and the fruit encouraged to develop along the leaders as depicted, through the method of pruning advocated, sap elaboration in the leaves becomes perfected through the free admission of sunlight to the foliage. By the same agency the fruit attains its perfect colour, and its uniformity of size is regulated by the careful selection of the light laterals and spurs, of equal strength, on which it is grown.

Some trees, such as Jonathan, Æsopus Spitzenburg, London Pippin, and others which yield the dessert varieties, while young and particularly when cultivated on rich soil, frequently produce fruit of too large a size to carry its full commercial value. When establishing the branch systems of such varieties under the favorable conditions mentioned, the pruner should provide for a greater number of leaders and more fruit-bearing wood than would be required under normal conditions in order to regulate the fruit to a marketable size. The surplus leader and lateral growths may be removed when the tree has assumed its fruit-bearing habit and settled down to normal conditions.

These precautions are not necessary when dealing with the varieties which yield large culinary fruit, as this is mostly retailed in larger parcels than the dessert varieties and its keeping qualities are not so easily impaired.

Then there are the varieties like Yates and Pomme de Neige, which, no matter how favorable the conditions surrounding their growth, rarely yield fruit above the dessert standard, but often when grown on rich land, produce rank and over-vigorous leader and lateral growths which it is often difficult to control. When establishing these also, extra leaders and laterals may be retained until such time as the tree becomes fruitful and amenable to control by pruning in the ordinary way, when they may be removed.

The thirteen-year-old Reinette de Canada tree shown in Plate 40 may be taken as an illustration of this method of preventing the too vigorous growth of the leaders by their excessive duplication while young. As the fruit shows a tendency to become small, and when the wood growths assume normal dimensions the surplus leaders and laterals may be gradually removed according to requirements to be judged by the pruner.

SHORTENING BACK THE LEADERS.

It will be understood that the leaders of a tree when about twelve years old will have become too long to satisfactorily support their fruit. *In fact the leaders frequently break down under the weight of the fruit* during years of heavy crops and particularly if the fruit is encouraged

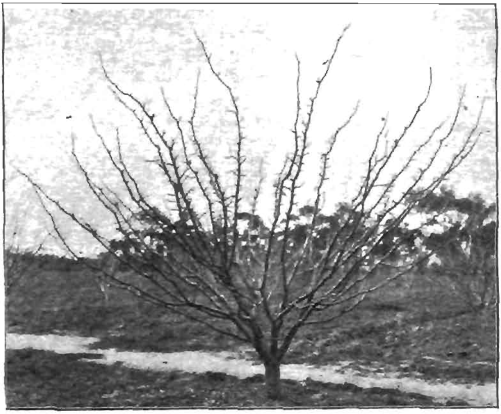

Plate 40.—Roinette de Canada, thirteen years old.

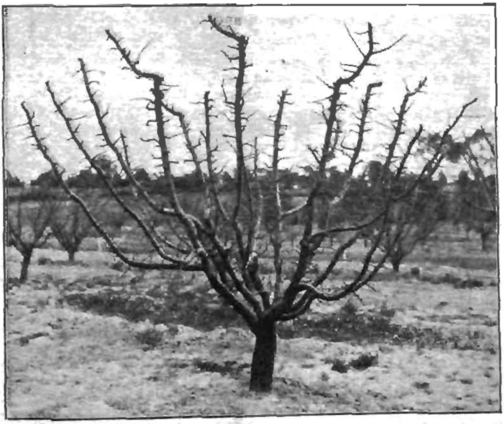

Plate 41.—Lemon Pippin, fourteen years old, with leaders shortened back.

to develop on long laterals near their points. Plate 40 is also a specimen of this type of tree. To prevent this excessive lengthening of the leaders, however, *they should be cut back occasionally to light and the more* suitable laterals on the two, or three-year-old wood, and those laterals utilized to extend the stiffened leaders which will be made shorter as a result of this treatment. This method also maintains the tree's symmetrical appearance.

When the trees are pruned in the ordinary way and when the leaders have extended beyond a reasonable length, some pruners shorten them

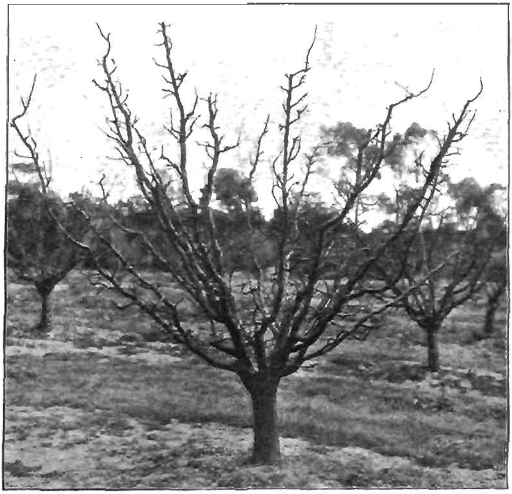

Plate 42.—Rome Beauty, thirteen years old, with leaders shortened back.

back by cutting in the internodes of the three or four-year-old wood like the fourteen-year-old Lemon Pippin tree shown in Plate 41. This method is to be deprecated as the gradual upward flow of the sap is prevented, and it gives the tree a stunted appearance.

The best method to adopt in a case of this kind is to cut back to light laterals like these on the Rome Beauty, Plate 42, when they are conveniently placed on the three or four-year-old wood. By this means the gradual upward flow of the sap is permitted, and the leaders are *encouraged to again extend from this point with the least possible interruption.*

Pruning of the Rome Beauty.

Before essaying the task of establishing and subsequently pruning an apple tree on modern, scientific and commercial lines, it is essential that the pruner should, as far as possible, make himself acquainted with all the characteristics pertaining to the wood growths and with the

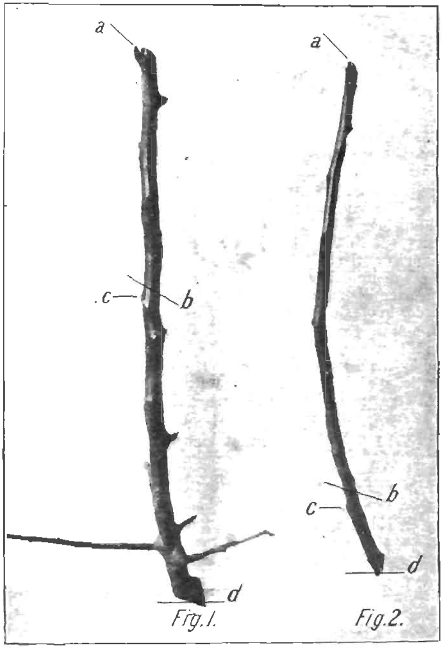

Plate 43.—Rome Beauty yearling leader growths.

continually varying soil, climatic and other conditions under which he is called upon to treat the individual varieties.

The Rome Beauty, particularly when grown on rich soil and owing to its habit of producing long barren leader and lateral growths, especially while it is young, is one of the varieties which is most difficult to bring to perfection, from the pruner's point of view. This is a

matter upon which most practical fruit-growers and pruning experts agree. For this reason the writer has specially selected the Rome Beauty as the first variety to be dealt with, and the detailed treatment recommended in its case is submitted for the consideration of the reader.

When all the details essential to the establishment and maintenance of this variety as a modern type of tree have been mastered, it will be observed that the shaping of other varieties more amenable to pruning treatment will have become an easier matter. The pruner will then have a confidence in himself which he did not hitherto possess.

The Rome Beauty, particularly while under five years of age and making strong wood, produces two classes of leader growths like these depicted in Plate 43. Both specimens were taken from the same three-year-old tree. They are one-year-old, and were cut at their base (*d*) from the two-year-old wood. Fig. 1 may be classed as fertile wood because it contains well-developed buds. Fig. 2 may be classed as barren because its buds are undeveloped and dormant.

When pruning Fig. 1 it should be cut as shown and bud (*a*) induced to continue the leader extension. Then the buds between (*a*) and (*d*) will almost invariably send out short light laterals of a fruitful character. But if cut at (*b*) and the leader encouraged to extend through bud (*c*) the buds between (*c*) and (*d*) will give out long, strong laterals of an unfruitful character. The pruner must judge from his experience the distance of the outer bud above (*d*) to which he is to cut in order to obtain the number and strength of the laterals he desires.

If Fig. 2, the barren growth, is cut as shown the leader will continue from bud (*a*), but, as almost invariably happens, no growths are produced by the dormant buds between (*a*) and (*d*). This is the reason why portions of barren leaders frequently appear in Rome Beauty trees. In order to obviate this, however, the leader should be cut at (*b*) when a strong growth containing well-developed buds will result during the next period of growth. Although all the buds along this growth are dormant, yet, an extension of the leader may be secured by cutting to any one of them. When the strong fertile growth has been obtained through the method of treatment described it may be cut long at next pruning so as to compensate for the barren wood removed.

When establishing a tree of this variety the primary object of the pruner should be to eventually construct one with leaders, and carrying their fruit wood like those shown in plates 34 and 42. When this method of scientific pruning is not practised, this variety produces long willowy growths and mostly carries its fruit on the points of the laterals. This deprives the tree of its symmetrical appearance and practically renders it unmanageable, especially when the leaders are kept hard pruned, and while they are making strong wood.

Plate 44 also depicts Rome Beauty leaders. Fig. 1 (*a*) to (*b*) is two-year-old barren wood pruned too long last year, but showing yearling wood with well-developed buds above the (*b*) cut. This should have been pruned at (*c*) and the young growth produced from (*d*). This specimen may be next pruned (*e*) and allowed to extend from (*f*). Fig. 2 is a strong fertile growth which may be pruned at (*a*) to enable (*b*) to produce the leader extension. Fig. 3 is a vigorous barren growth which if cut (*c*) and allowed to extend from (*d*) will be the wrong

method. It should be pruned at (*a*) and extended from (*b*). Fig. 4, (*a*) to (*b*), is three-year-old barren wood, which was pruned short last

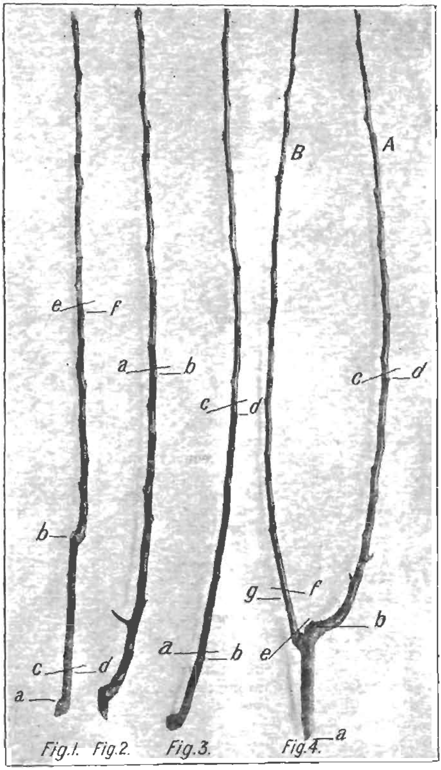

Plate 44.—Rome Beauty leader growths.

year into the two-year-old wood at (*b*). As usually happens when two growths are produced on this class of wood, a fertile leader (A) was

sent up from the terminal bud, and a barren one (B) from the bud immediately beneath it. Should (A) be retained as the leader it may be cut (*c*) and allowed to extend from (*d*), at next pruning, when (B) may be removed at (*e*). But should it be decided to retain (B) it may be cut (*f*) and lengthened from the (*g*) bud.

It has been previously stated that an angle of 40 degrees from the vertical is a suitable one to which to train the leaders. When they

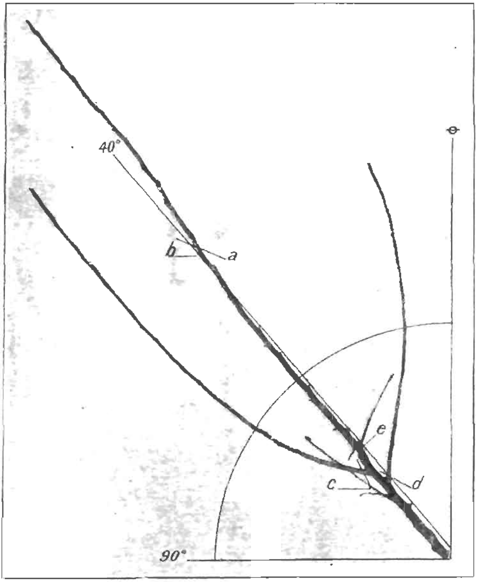

Plate 45.—Pruning the leader when it grows at a suitable angle to the vertical.

assume this position as shown by the one in quadrant in Plate 45, it is pruned as depicted. It grew from last year's cut (*e*), and should be next cut (*a*) to the outer bud (*b*) so as to continue the leader on the 40 degree line. The two strong barren growths may then be removed at (*c*) and (*d*), and the lighter ones are retained.

Varieties with strong upright habit of growth frequently require different treatment. Plate 46 shows same leader in a more upright

position in the quadrant, and with its outer barren growth on the 40 degree line. If it is desired to maintain the correct angle this growth should be made to assume the leadership by cutting it at (*a*) to the dormant bud (*b*). Then the other two strong growths may be removed by cutting at (*c*) and (*d*). In pruning upright growers like the States-

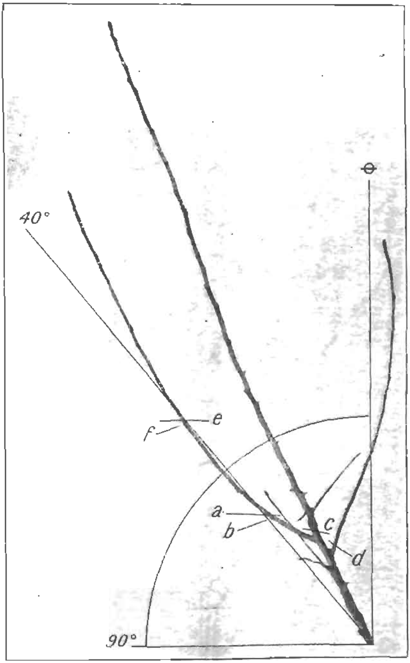

Plate 46.—Pruning the leader when it grows at an unsuitable angle to the vertical.

man, which produces well-developed buds upon all their growths, they may be cut (*e*) to buds corresponding with (*f*) in order to secure a more reasonable length of leader annually.

Plate 47 shows two unpruned Rome Beauty leaders, and the letters (*d*), (*c*), (*b*) and (*a*) represent in each case, the points at which the

annual cuts were made, and above which the portions of wood are one, two, three, and four years old respectively.

When Fig. 1 was cut at (*b*) it should have been pruned at (*e*) and in all probability a fertile growth would result from bud (*f*).

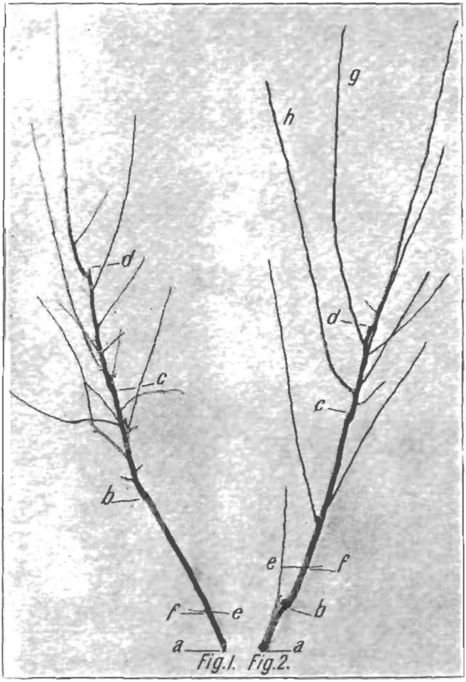

Plate 47.—Rome Beauty leaders unpruned.

When pruned at (*c*) and (*d*) the lengths of fertile wood were nicely gauged, and a suitable number of fruitful laterals were obtained as a result of these cuts.

Fig. 2, (*a*) to (*b*), is barren wood four years old. It was cut correctly at (*b*) when one year old, but a partly barren growth was the result.

Instead of cutting this at (*c*) it should have been pruned at (*e*) and made to extend from the (*f*) bud. Then the next year the (*d*) cut was made too close to (*c*), and consequently the strong barren laterals (*g*) and (*h*) were produced. At next pruning it is necessary to completely suppress these, and shorten back the lighter ones.

Plate 48 shows the same leaders pruned in the manner recommended under the circumstances.

Fig. 1 is a good type except for the barren portion, as it carries nice fruit laterals above that point.

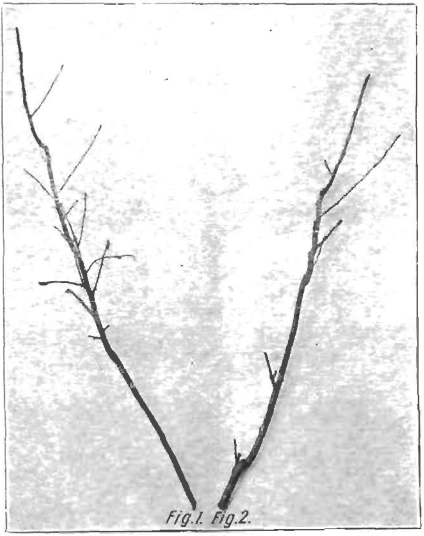

Plate 48.—Same leaders pruned.

Fig. 2 is not as good a specimen, because not only was the barren three-year-old wood cut too long, but the two-year-old wood was cut much shorter than its strength warranted. This necessitated the removal of the strong laterals which it produced, because if short portions of these are retained they usually reproduce strong growths. Frequently this, like other varieties, develops latent buds at the base of the strong laterals. When the laterals are removed these buds send out light short growths, which may be utilized to clothe the leader with a suitable quality of fruit wood.

TREATMENT OF ROME BEAUTY LATERALS.

Now that the structural formation of the Rome Beauty tree generally and the individual treatment of its leaders have been dealt with, the reader's attention is directed to the system of pruning advocated in connexion with the various types of lateral and spur growths which appear on this variety.

It has been stated that two classes of leader wood are produced by this variety, viz., fertile, and barren. This remark also applies in the case of the laterals.

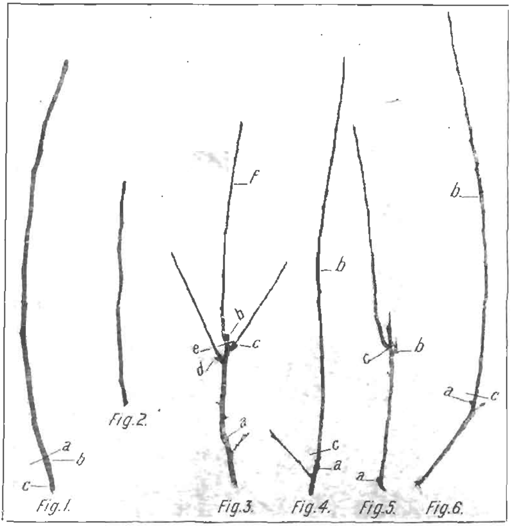

Plate 49.—*Treatment of Rome Beauty laterals.*

Plate 49, Fig. 1, is a strong barren yearling growth which, when it appears on the two-year-old leader wood, and particularly if it is near the base of the yearling extension, should be completely removed at winter pruning. But when produced on the barren portion of a leader it may be converted into a better class of fruit wood by duplication. To do this, cut at (*a*) so that the buds (*b*) and (*c*) may produce weaker growths like those on the barren leader between (*b*) and (*c*), Plate 47, Fig. 2. Should the resultant laterals be again too long and unfruitful

prune them as shown in Plate 48, Fig. 2, and continue this method until fruitful wood is developed. Fig. 2 is a one-year-old short lateral which.

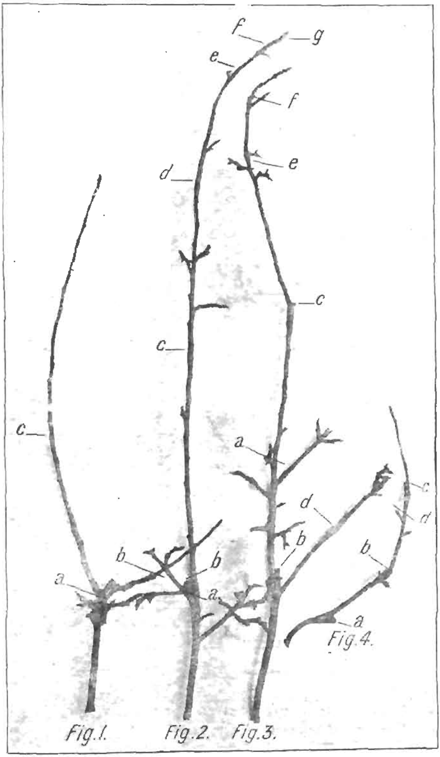

Plate 50.—Older Rome Beauty laterals unpruned.

although it has dormant buds except the terminal one, may be retained. Next year it will fruit on the terminal bud and a small growth or two

may be sent out from that point as well. Fig. 3 is three year old, and when cut at (*a*) in the yearling barren wood it gave out a fruitful growth, which, when pruned (*b*) the following year sent out the (*f*) shoot. It fruited on the buds (*c*) and (*d*), and produced two small growths from these points as well. To keep this growth fruiting near the leader prune it at (*e*) in the two-year-old wood next year. The weak laterals, if they fruit on their points and send out extensions next year, may be shortened back similarly at next pruning. Fig. 4, when cut at (*a*) in the yearling barren wood, sent out an equally barren growth to (*b*), but the following year, instead of fruiting on the terminal bud, a growth with well-developed buds was produced. As this fruitful wood is too far removed from the leader, the whole lateral should be removed by pruning at (*c*), in order to develop the two buds below that point and to strengthen the small growth appearing there.

Fig. 5, like Fig. 4, when pruned at (*a*) in the barren wood, gave out a partly barren growth during the next year. This fruited on the bud (*b*) during the succeeding year, and sent up an unfertile growth from the bud above it. To prune this specimen cut at (*c*) as shown in order to strengthen the partly developed fruit buds below that point. Fig. 6 is also three-year-old wood from the leader. It grew to (*a*) the terminal bud during the first year, fruited on this bud, and sent up the barren portion to (*b*) during the second year. During the third year the portion from (*b*) to the point which is fruitful was produced. This specimen should be pruned like (*c*) in order to develop the fruit buds between this point and the leader.

Plate 50 shows four Rome Beauty laterals of the class which usually appears on old trees of this variety, the pruning of which has been partly neglected or imperfectly executed. A neglected tree carrying this class of fruit wood may be renovated by shortening back the laterals as depicted in the illustration.

Fig. 1 was bearing its fruit on spurs below (*a*) until two years ago, when it gave out the barren growth (*a*) to (*c*), which was continued from (*c*) upward last year. To regulate this specimen cut at (*a*) and (*b*) to remove the strong wood and strengthen the spurs below these points.

When Fig. 2 was pruned at (*b*) it sent out the growth to (*c*). This continued to (*d*), (*e*), (*f*) and (*g*) during the succeeding years, and finally fruited on the terminal bud (*g*) last year. This growth should be removed to (*a*) at next pruning.

Fig. 3 was also pruned, only once, at (*b*) after which the fertile wood to (*c*) was produced, and it fruited as the scar indicates on the terminal bud (*c*). During the next two years it extended to (*e*) and (*f*) respectively. The following year it fruited at the terminal bud (*f*) and produced the piece of wood above that point. The sublateral fruited at the point (*d*), and subsequently developed the fruit spur on the extension. To prune this specimen remove the upper portion by cutting at (*a*).

Fig. 4 fruited on the terminal bud of the yearling wood at (*a*) and produced the extension to (*b*). This point was then the terminal on which it again fruited, and made the two-year-old wood above it. This

was cut at (*e*), when the yearling wood was produced, and the fruit buds on the two-year-old wood strengthened. To prune this specimen cut as shown at (*d*).

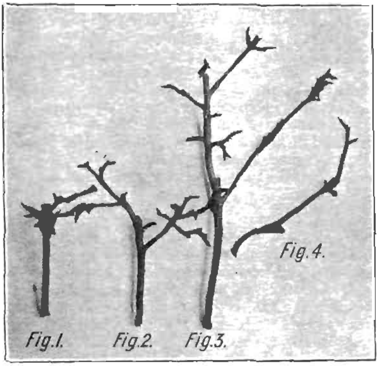

Plate 51.—Same four laterals pruned.

Plate 51 shows the result of this treatment. Figs. 1, 2, and 4 are of reasonable length, from 12 to 15 inches. Fig. 3 is rather too long, but provided the tree carries a plentiful supply of fruit wood, this may be shortened back to the lower spurs according to requirements.

(*To be continued.*)

It is a truism to say that fertilisers should be bought and used with discretion; of course they should, but it is well to keep distinctly in mind that they should be purchased solely for the amount of nitrogen, phosphoric acid, and potash contained in them, assuming always that the ingredients are derived from a good source, because there are some substances, such as leather, for instance, in which the nitrogen has no fertilising value, and there are others in which the nitrogen being partly inert, has not so much value as in good guano, nitrate of soda, and such high-class articles.

MORTALITY OF DAIRY COWS IN THE HAMILTON DISTRICT.

By E. W. Murphy, Dairy Supervisor.

Settlers on the Closer Settlements Blocks at Strathkellar, near Hamilton, have experienced keen disappointment, and incurred heavy losses, through the deaths of large numbers of milking cows. The estate was subdivided ten years ago, and preference was given to experienced dairymen, as the land was thought to be very suitable for dairy farming, but when I came to inspect the district in March, 1916, I found that the industry was at a very low ebb, and many of the farmers so disheartened as to have given up milking cows altogether.

On some of the blocks, cripples, paralysis, and rickets have been a continuous source of loss, and on other farms it was in droughty seasons only that there was any particular trouble. Many of the farmers have a very confused idea of the underlying causes of the evils, and I have not met any stock-owner yet who had a grasp of the whole of the facts. A clear understanding of the nature of the complaints, and of the predisposing causes, is of great importance, so that we can work on right lines towards overcoming them. I became acquainted with several drenches that gave good results. Mr. Chadderton, the Jersey breeder, informs me that since he has depended upon a simple drench (that was recommended by some cattlemen), he has not lost any, though the cows were affected in the same way as formerly, when they used to die. Mr. Chadderton uses one cup of kerosene with one cup of water and one tablespoonful of baking soda. I listened to the descriptions of the manner of the onset of the complaints, and came to clearly see that there was some other factor besides malnutrition, and eventually *concluded that some form of infection or poisoning must be operating.* Having formed such opinion, I looked up authorities on the question of forage poisoning, and found that Dr. S. S. Cameron gave an address on "Cripples" to the Chamber of Agriculture Convention in 1906, and *inter alia* he said, "the trouble is widespread, and I have frequently found that the nasal mucous membranes were engorged with blood," and he suggested that the cause was an infection through the nose, of Mycotic Poisoning.

Professor L. H. Pammel, Ph.D., of Iowa State College, in his *Manual of Poison Plants*, published in 1910, describes the symptoms of Forage Poisoning, and such description agrees completely with the reports of many of the cases occurring in this district. Among other names, it is called Epizootic Cerebro Spinal Meningitis, or known locally as "Grass Staggers," "Choking Distemper," &c., and he gives the symptoms as follows:—

"Weak, staggering gait, and the pharynx is either partially or completely paralysed. The tongue may be affected and protrude from the mouth, and saliva falls in strings from the lips. The pulse is variable. The respiration hurried and jerky. In the sub-acute cases the first

sign will be slowness of mastication and difficulty of swallowing; temperature sub-normal, and heart and respiration little affected, and the bladder and bowels inactive. There is but slight rigidity of the muscles, if any, and no evidence of pain is apparent. Such may last a few days, and then a gradual improvement occurs, or the paralysis may become more complete, and the general weakness more marked, paroxysms of delirium develop, with inability to stand, breathing becomes more laboured, coma comes on, and death results apparently without a struggle. This form lasts from six days to two weeks. As a rule, the *post-mortem* examination reveals no naked eye changes in the tissues of animals dead of forage poisoning.

In acute cases of forage poisoning, treatment is seldom successful, but quick-acting stimulants may be tried. In sub-acute cases a purge should be given to clear the intestines of the poisons. Strychnine in large doses to overcome the extreme depressions of the nerve centres, and atropin to support a failing circulation may be administered hypodermatically, at frequent intervals, with benefit. In very mild cases all that is necessary is to empty the bowels with a purge, and put the animal on feed above suspicion."

After reading the above statements and descriptions, and the treatment recommended, by the authorities mentioned, the following facts regarding methods of treatment which have been successful here, should be interesting:—Drenching with kerosene one cupful, water same quantity, and a tablespoonful of carbonate of soda, is a decided success; a decoction of a wild herb "sneezewort" and a decoction of yarrow and wormwood also gives good results. The wormwood is a powerful stimulant, and it is a vermifuge, and the yarrow takes the place of the atropin, as it affects the circulation. Professor Ewart says that an allied species of the "sneezewort" is used as a vermifuge, but that is all that he could say of it as a medicine. Yet I am satisfied from the reports of its effects, that it is a powerful stimulant also. Care must be taken that none of these agents are forced into the lungs, and when the animal is unable to swallow the medicine, a piece of guttapercha piping should be employed, and at Mr. P. Fry's farm at Victoria Valley I saw a very good device for this purpose. A piece of wood with two holes bored in it so that it can be tied on as a gag and a third hole large enough for the piping is bored through the middle, and with a funnel you can pour in a dose through the tube. As a number of cows have died during the past spring, and also since the New Year, and as the remedies that I speak of are not as well known as they deserve to be, I consider that the information is valuable, but the facts of paramount importance are those relating to the predisposing causes. Though there is an infection or poisoning in operation, it is certainly associated with malnutrition. The districts most affected are those which are very deficient in phosphate of lime, and in such areas the herbage is harsh and innutritious. Phosphate of lime is necessary for the vigorous and healthy growth of grass, and it is essential to the sound health of animals. If it is deficient, there cannot be the nervous energy that is needed for metabolism, and, in consequence, there is a lowered resistance to disease or the invasion by micro-organisms. In a disease like anthrax the control of infection is the salient point, but in respect to meningitis the medical profession

the protective forces. In the *Scientific Australian* for December, 1915, Professor W. A. Osborne, D.Sc., states:—

"Protective substances exist in various grains, and if animals are fed on food deprived of such substances, polyneuritis develops." Skim milk is good for "cripples," and I heard the late Dr. Rothera give an address on the importance of the Vitamines in milk, but as milk contains lime and phosphorus the good results may be due to the minerals. Potatoes and apples also give good results, and plainly, good succulent food is essential to the maintenance of the protective forces of the cow's system. Rickets is undoubtedly a "deficiency disease," and in other cases the depletion of the nerves, causes a lowered vitality, and this in conjunction with harsh indigestible fodder, and reluctance to drink foul water, may cause impaction, pure and simple, which leads to fermentation and auto-intoxication that causes paralysis, but such is not always the cause of paralysis. Infection, or poisoning, inducing paralysis, may often be the cause of the impaction, and in many cases there is no impaction at all, but just paralysis of a vital part caused by the infection.

Cattle in this district are always chewing bones, and thus indicate their craving for phosphate of lime. They will lick up mortar made with lime, and they lick up the phosphatic manures if they can reach the bags. Sometimes they have favorite earth licks, and thereby are more liable to infection by organisms in the soil, and the earthy matter ingested may form hard insoluble balls of considerable size in the stomach. The habit of chewing bones involves the risk of sharp-pointed pieces being swallowed, and all sorts of rubbish is also chewed when they have such cravings, and the danger from sharp-pointed objects is increased, as such objects may pierce the stomach and penetrate the heart.

The great essential is the improvement of the pastures. Lime and phosphorus must be applied. It is a sound business proposition from every point of view. It means greater carrying capacity and prolonged seasons of growth. Through the increased vigour and vitality of the grass roots, the spring will be earlier, and it will stand the dry weather better, which means a longer milking season. Every form of stock farming depletes the soil of minerals, and this must be balanced by artificial manures or by feeding the cattle with purchased foods, that are rich in phosphates such as bran, if we are to maintain the fertility of the soil. Milk contains .7 per cent. of minerals, and if the herbage is deficient, then the cow's system is depleted of essential elements, and she goes down. Some of the Strathkellar paddocks were never any good for cows, and very plainly the whole countryside is badly in need of phosphorus and lime. Very good ground limestone is obtained at Heywood, 36 miles from Hamilton, and there are deposits of lime, a few miles down the Grange Creek from Hamilton, that should be well worth opening up. The depletion of the dairy herds and the losses of other cattle have become very serious matters indeed. The prevention of the slaughter of the female stock may be a contentious matter, but there can be no doubt as to the wisdom of any steps that will increase the supply of fodder or improve its quality, at a reasonable cost. It is obvious enough that much can be done in the way of conserving spring growths that now go to waste, and the silo, and the meadow haystacks are conspicuous by their absence; but, above all, I strenuously advocate the improvement of the pasture by top-dressings of lime and phosphates.

NOTES ON PORTUGUESE WINE VARIETIES.

By F. de Castella, Government Viticulturist.

(Concluded from page 686.)

In conclusion of this somewhat lengthy description of the varieties grown for the production of Port wine in its native Portugal, a few more sorts must be mentioned, but since, with the exception of Tinto Cao and perhaps also of Tinta Carvalha and Tinta Roriz *, they are unlikely to prove valuable acquisitions for Victorian vineyards, brief descriptions will suffice.

The varieties to be described in the present article are the various "Tintas" and a few other sorts not much cultivated now, even in Portugal. The Tintas do not really make up a group; their inclusion under one heading is a matter of chance rather than one of common origin, since the different vines are not related in any way. The word "Tinta" in connexion with a vine merely signifies *red or black;* in fact, "dark coloured." Tinta Roriz thus means nothing more than Roriz black, and so on.

Of the varieties which follow, Tinta Cão and Tinta Francisca are quality sorts. The others are vines grown for quantity rather than quality; they are, in fact, the *bourgeois*, or common, varieties which, according to Sr. Duarte de Oliveira, save the situation by preventing the yield of the Douro vineyards from being altogether too low (see *Journal,* September, 1916, p. 569).

The exact value of Portuguese wine grapes, especially of the quantity sorts, is not always easy to correctly estimate, owing to the system of blending the grapes of a good many different varieties in the fermenting vat, or lagar. In fact, until recently, it was a common practice for the vines to be mixed in the vineyard instead of being grown in separate blocks.

Tinto Cão.

Tinto Cao is undoubtedly one of the leading quality varieties cultivated in the Alto Douro. It may be assimilated to the Bastardo type, since it produces wines of excellent bouquet and flavour, and which mature rapidly. Seeing that it does not possess the defect of Bastardo of shrivelling too readily in a warm autumn, it would seem to be well suited for sweet wine production in Northern Victoria.

When visiting Portugal in 1907, the writer was informed by one of the partners in the well-known firm of Cockburn, Smithes, and Co. that the quality of the wine yielded by one of their choicest quintas, or vineyards, was mainly due to the fact that so large a proportion of Tinto Cao is grown there.

Rebello da Fonseca (1791) says of it—"Tinto Cão . . . merits one of the first places amongst the vines cultivated in Portugal; it ripens well, and neither dries up nor rots; it does not yield excessively, nevertheless of its crop everything is preserved, and from it is made a wine of good body (*muito coberto*), strong and generous." He relates how Sr. Manuel Xavier Ribeiro Vaz de Carvalho made in 1771 some wine from this grape alone, and it proved superior to all his other wine and to those made by his neighbours; a wine so highly thought of by the

* Tintas Carvalha and Roriz may prove of value in Victoria for the production of dry red wines.

English merchant Francis Bearley that he would have bought it at an extraordinary price had this not been contrary to the law.*

He attributes the superiority of the wines of Gurnes over all the other wines of the Alto Douro to the fact that "in these vineyards are cultivated a great quantity of Tinto Cão and Pé Agudo, which mixed with Alvarelhão . . . . make a wine which the English merchants most esteem at the present time: they *acknowledge that they find in it colour, bouquet, body, and flavour to their entire satisfaction.*" He further states that it is a variety which grows so vigorously, and has so much foliage that the fruit is too much sheltered and thereby hindered from ripening, for which reason it should be pruned to three or four spurs of three or four eyes each, according to the vigour of the vine.

Fig. 16.—Vine of Tinto Cão.

Photo. taken in October, 1907, at Boa Vista. Note the extremely stony nature of the soil and the curious method of training to numerous small stakes (mostly bamboo), which was general in the Alto Duro district, but which is now being gradually replaced by wire trellis.

Like Mourisco Preto, it was, in the early days of the phylloxera invasion, erroneously supposed to be phylloxera resistant, and seedlings from it were largely raised and distributed, but without practical result.

Sr. Duarte de Oliveira deals at some length with this vine in *Ampelographie.* Its origin is unknown, but it is probably a native of Portugal, where it has been known for a very long time. The name Tinto Cão signifies red dog, or rather black dog, no doubt in reference

* The price fixed by the Companhia Geral das Vinhas do Alto Douro for these wines was 25,000 reis, equal to 125 francs per pipe of 550 litres (£5 for 121 gallons), according to laws of the time, and this price could undergo no modification, even in years of insignificant crop. This company was created in 1756 by the Marques de *Pombal, the celebrated Minister of King Don Jose I. (Duarte de Oliveira in* Ampelographie).

to the colour of the berries. He regrets the neglect of this and a few other of the choicest Alto Douro varieties since reconstitution.

"On going through the ancient Douro vineyards, those especially which by their importance have created the just reputation of port wine, one regrets deeply to see that celebrated vines like Tinto Cão, true creators of our great wealth, are disappearing more and more to make place for others quite plebeian, and which have not the least title to recommend them, and to cause them to be received among the noble varieties which clothe the steep hills bordering the impetuous river of Northern Portugal. But a similar wrong tendency prevails in all countries: in Spain as in Italy; in France as in Portugal; here, especially in the region of wines which have no rivals in the world as liqueur wines, the error exists, and it is one that will cause itself to be felt ere long of abandoning little by little the varieties which have created their reputation during long years."

He cannot understand Odart, who says of it, "Good wine, a little hard; needs ageing," and points out that on the other hand table wine

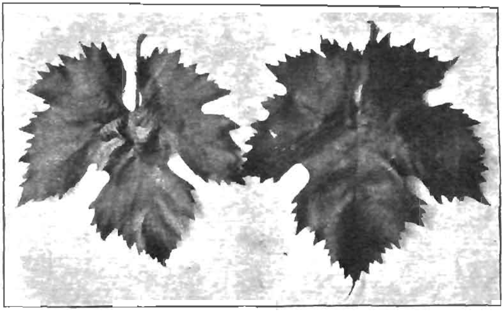

Fig. 17.—Leaves of Tinta Cão (about one-third natural size).
Photo. taken at Boa Vista, Alto Douro, Portugal, in October, 1907.

made from Tinto Cão does not need to be too old for it to be irreproachable. He quotes Dr. Joaquim Pinheiro d'Azevedo Leite, who says, "As it is a vine of medium yield, it is little grafted, especially now that more productive varieties are preferred."

In order that it may show what it is worth from a wine-making stand-point, it requires a good aspect and the schistose soil of the Douro, which is very poor, and where manuring is not practised. In old days, the laws of the country prohibited the manuring of vineyards, the object being to sacrifice quantity to quality. (Law of King Don Jose I., 30th August, 1757.)

On richer soils this variety is capable of yielding much heavier crops, though naturally not of wine of the same quality.

The wine of Tinto Cão is very perfumed, and reminds one of that of Touriga, though its colour is not so deep. *Pinto Villar* (1815) is quoted as saying that this variety produces an excellent wine with a magnificent bouquet and a charming flavour, but it lacks colour.

The following Ampelographical description is given:—

Vine.—Of medium strength; main stem flattened and twisted; bark ash colour, detaching in short strips.

Buds.—Large, young leaves, five-lobed; silky and ashy white; bordered and spotted with rosy carmine above; under side cottony, white; teeth well marked, deep carmine at the points.

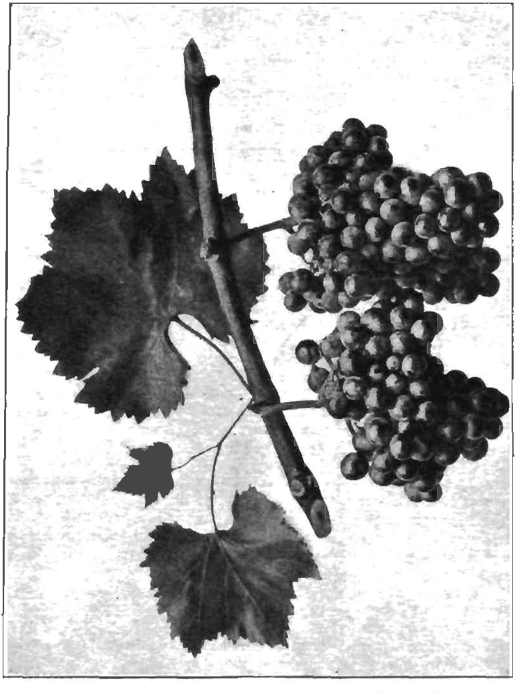

Fig. 18.—Bunches of Tinta Cão.

Reproduced from *O Portugal vinicola*. Reduced to two-fifths natural size.

Canes.—Very long, round, of medium thickness, trailing, light-green, striated with red on the side exposed to the sun, downy, brittle at the knots, internodes long, 10 to 15 cm. (3.9 to 5.8 in.), knots medium; tendrils bi, or tri-furcate, numerous, tinted with red, very long and slender.

Leaves.—Large, thin, as broad as long, five-lobed; upper sinus little open and shallow, often with a tooth at the base of the sinus; lower sinus also little open and sometimes scarcely indicated; they also have, like the upper ones, a tooth

at the base. The petiolar sinus is cut out in the shape of an inverted U: upper surface yellowish-green, glabrous: veins of a paler yellow and not prominent: lower surface yellowish and cottony; veins paler and stronger: teeth small, in two series, those terminating the lobes are large and prominent; all more or less mucronate. Petiole cylindrical, strong, long, slightly downy, tinted red.

Fruit.—Bunches medium size, loose, conical, usually the stalk divides at its first joint, bearing two bunches of almost the same shape; when the bunch is single it is tighter, and bears shoulders on long stalks: stalk striated, very long, the upper part cylindrical and woody, and the lower part herbaceous, flattened or fasciated; pedicells short, slender; swelling large, with a few scattered brown warts; core large and vinous colour, not easily detached—berries small, almost spherical, black with bluish reflections; flesh not very juicy, soft, with a single flavour, and sometimes slightly acid before complete maturity; skin thin and soft; style point not very visible. Pips per 100 berries—2 with one, 40 with two, 45 with three, and 13 with four.

As will be seen from the photo, the leaves of Tinto Cão are strikingly different from those of most other vines, reminding one almost of those of an Oriental plane, thus rendering this vine very easy of identification.

Tinta Francisca.

Synonyms: TINTA FRANCEZA, TINTA DE FRANCA.

Tinta Francisca is another of the choice port wine sorts; most of the leading authorities speaking very highly of it. It is a vine well suited for the driest and hottest Douro hillsides, since it does not suffer from sunburn. In moister situations and on richer soil it does not thrive; it comes into leaf very late, and often sets its fruit badly. On the Douro it is considered a good bearer.

Much confusion has arisen, in Portugal, in connexion with this variety, and its two synonyms given above, several distinct vines being sometimes cultivated under one or other of these names in different districts. Amongst others, the French *Teinturier,* the red-juiced grape we call Tinto, in Victoria, is sometimes known as Tinta Francisca. Nevertheless, the true vine of this name is a well-defined sort, and one of the principal ones in Douro and Traz os Montes, the port wine region.

The wine yielded by it is of excellent quality, possessing much bouquet and good body; it has also a good deal of colour, though this is rather unstable. Its wine is in fact rather soft, and ages very rapidly; this appears to be its main defect. It is, in short, a wine liable to oxidation, which becomes tawny or onion-peel colour at two or three years old.

Tinta Carvalha.

Two distinct vines are known under this name in Portugal; one of which is grown on the Douro, and the other in the Traz os Montes district; the former is the most important, and the only one deserving attention here.

Carvalha means oak, but this tree has no connexion with the name of the vine. Several Portuguese vineyards are called Quinta das Carvalhas (The Oaks Vineyard), and a vine, especially if a new introduction, is often called after the vineyard from which it was obtained.

Tinta Carvalha is a quantity rather than a quality variety. It belongs to the group known in Portugal as Tintas Grossas.* Nevertheless, the wine made from it is of delicate flavour, though lacking in body

* Literally, black grapes with large berries.

and colour. It is something after the style of that yielded by Donzellinho do Castello and Mourisco Preto, though possessing less bouquet. Though a quantity variety, it is nevertheless to be found in most of the good Douro vineyards, and its wine appears to be of higher grade than that of the other heavy bearers grown on the Douro.

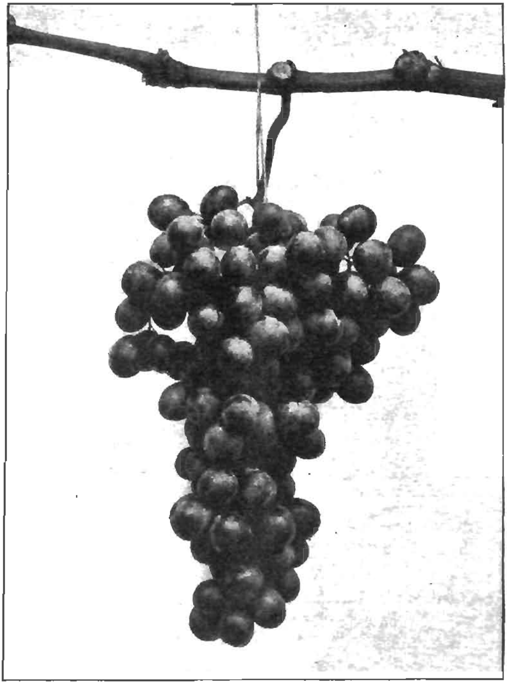

Fig. 19.—Bunch of Tinta Francisca.
Reproduced from *O Portugal vinicola.* Reduced to about one-half natural size.

This vine may prove of value in Victoria, but rather for the making of light dry table wines than for those of Port type. Even when made into a light dry wine in Portugal, it benefits by being blended with some Souzão or Touriga to improve the colour.

It may be pruned short, or according to the Guyot system, with short rods; if pruned too long it soon exhausts itself and ceases to produce abundantly. It does very well grafted on Du Lot. It suffers little from Oidium, comes into leaf early, the fruit turns colour very early in the autumn, and ripens early; but, like Chasselas, the grapes hang well on the vine.†

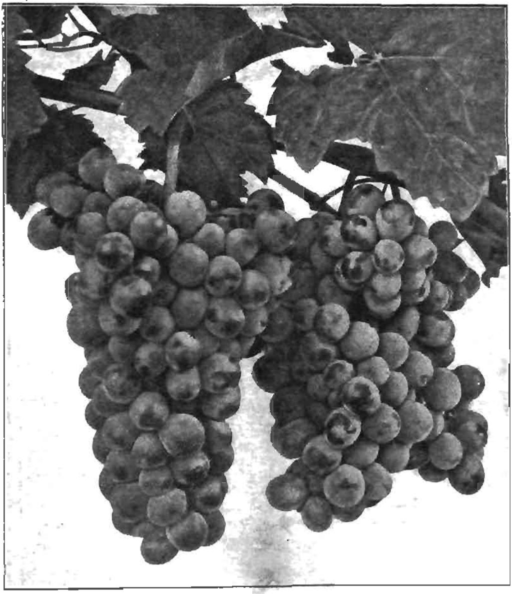

Fig. 20.—Bunches of Tinta Carvalha.

Reproduced from *O Portugal vinicola.* Nearly one-half natural size.

Tinta Amarella.

This is another of the "quantity" varieties of the Alto Douro, and one concerning which the earlier writers seemed to have formed a higher opinion than present day authorities.

† Particulars taken from the article by Sr. Duarte de Oliveira, in *Ampelographie.*

Gyrao (1822) tells us that—

"Tinta Amarella gives much wine; it requires strong soil. The wine made from it by Srs. Villares in the course of their wine-making experiments was of good flavour (*gostoso*) and of yellowish colour."

Villa Maior (1865) mentions it in several well-known Quintas, and states that—

"It is incontestably one of the sorts of best reputation on the Douro. . . . It was one of those chosen to predominate at the Quinta dos Arcyprestes (Alto Douro) and was preferred for the hottest situations at the Quinta do Noval." Writing in 1875 he says: "It is one of the best grapes of the Douro; very productive, with very tight bunches of sweet berries, for which reason the bees seek them in preference to other sorts. Tinta Amarella requires to be grown on strong soils in order that it may prosper."

Sr. Duarte de Oliveira does not hold so high an opinion of it, classing it essentially as a quantity variety, yielding a wine of a rather dull red

Fig. 21.—Leaf of Tinta Amarella (about one-third natural size).
Photo. taken at Boa Vista, Alto Douro, Portugal, in October, 1907.

colour, becoming an unattractive rust colour whilst still young. It is a flat wine without briskness or character, either as regards bouquet or flavour, and of little use for the production of dry table wines. It is one of the Douro varieties which yields most juice; curiously enough, the grapes seem to contain even more juice as they become overripe. The fruit is rather liable to rot in a wet vintage.

Since reconstitution, this vine has been somewhat discarded in the true port region, but in the neighbouring district of Baixo Corgo it was propagated to such an extent as to impair the quality of the wine.

The word Amarella means in Portuguese "yellow." It appears to refer to the canes, which are of a yellowish-brown colour in early winter,

and more especially to the leaves, which are of a yellowish-green colour, more particularly in early spring.

It is a vine which does well on sunny hillsides, since it requires warmth to ripen thoroughly. It may be pruned, according to the Guyot

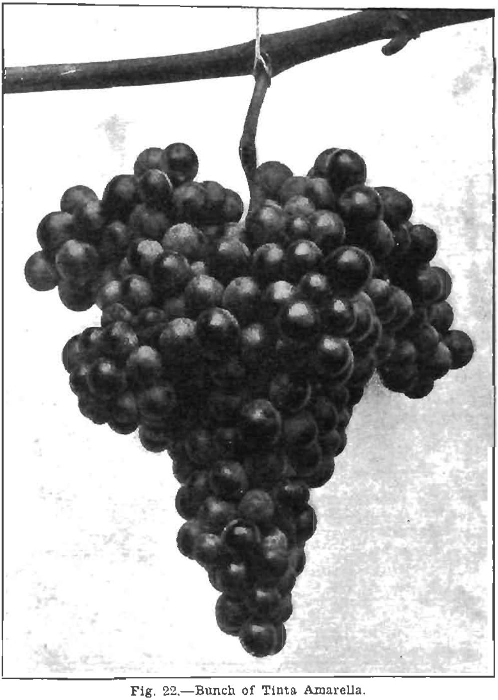

Fig. 22.—Bunch of Tinta Amarella.

Reproduced from *O Portugal vinicola*. One-half natural size.

system (single or double) with short rods. One of its peculiarities is that a good many of its buds are blind and do not sprout in spring; it is somewhat liable to *encannelamento*, the somewhat mysterious disease known as *court noué* in France; it seems to be fairly resistant to fungus diseases.

Tinta Roriz.

This is a vine of unknown but apparently somewhat recent origin, since it is only mentioned by recent writers. It is probably named after the Quinta de Roriz, where it is rather largely grown; it has become popular on the Douro since reconstitution.

It is essentially a "quantity" variety, producing abundantly, and the yield of juice (per ton of grapes) being very high. The bunches are very large, with large black berries of sweet, agreeable flavour, slightly acid. It is a variety of value which gives character to the wine which it produces.*

Sr. Duarte de Oliveira thinks that if it were not mixed with choicer sorts its must, which is flat and without special flavour, would not produce a wine of quality. It is not a variety calculated to bring renown to a vineyard. Curiously enough, it is in cooler districts that its must seems to contain more sugar, as compared with other standard sorts such as Mourisco Preto. It is a very heavy bearer, which does well with long pruning. It is very liable to fungus diseases.

. . . .

The remaining port wine varieties do not merit detailed description; they may be summarized as follows (particulars taken from Ampelographie):—

Entreverde.—An old Portuguese variety ripening very late; almost unknown nowadays.

Casculho.—A Douro variety, scattered and scarce in the vineyards.

Mureto (or *Moreto*).—An old Douro grape, which has been almost completely neglected since reconstitution, though wrongly so, according to Sr. Duarte de Oliveira, since it is essentially a quality variety, yielding a fine ruby-coloured wine with a special character of its own. It is a good bearer, and well suited for warm dry situations.

Nevoeira.—A very heavy yielding vine, producing a red wine, light in colour, with scarcely any bouquet, and fairly acid, with a slight gooseberry flavour—a very common wine.

Péaguda.—A black Douro variety, which is disappearing from the vineyards since reconstitution.

Tinta Castelloa.—A very old Douro variety, suited for deep rich soils, although also grown on dry hillsides—abandoned a good deal since reconstitution, owing to irregular yield and liability to set badly—wine of rather poor quality, similar to that of Tinta Amarella.

Tinta Lameira.—Similar to last named, though the wine appears to be of better quality.

Tinta Morella.—A little-known Douro variety—large-shouldered bunches with large, light-red, oval berries.

Tinta Pinhera.—Said to be synonymous with Pinot Aigret, an inferior form of the Pinot Noir of Burgundy.

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* Cincinnato da Costa, in *O Portugal Vinicola*

THE BUILDING OF A GOOD HERD.

(a) TEST YOUR COWS.

By J. Kyle, Dairy Supervisor.

Many of our dairy farmers sell good cows considering them to be worthless. This apparently is a peculiar statement to make, but, nevertheless, it is only too true, and it is an astounding fact that so many of our dairy farmers have so little idea of the actual value of their cows. This unfortunate state of affairs will continue to exist until accurate records of the milk yield from each individual cow are kept and the use of the Babcock tester becomes more general. The only reliable way to arrive at the true merits of any dairy cow is to estimate her value by the use of the Babcock test and the keeping of accurate records of the quantity of milk she gives. Unless the individual yields from each cow are carefully noted, it is impossible to make a proper selection of a profitable cow. Cow testing thus enables the farmer to find out the cows that are profitable, and those that are not paying their way. In some cases over one-quarter of the herd has been found when the milk was tested to be unprofitable. This means to the farmer a direct loss in energy, feed, and money.

The average production per cow of milk and butter-fat in this State is not what it should be; this is the result of keeping such a large number of unprofitable cows. It is impossible to detect unless a system of weighing the milk from each individual cow, keeping her records, and the use of the Babcock tester, be carried out. By this system the farmer is enabled to find out which cows are the best producers of milk and butter-fat. It is hardly possible to estimate the real value of a dairy cow by outward appearances, as it is known that the milk of some of our best looking cows is very low in butter-fat.

Cow testing also helps to discover the great differences in persistency of the milk flow, and the slightest variation in the individual records causes the owner to look for the reason of the shrinkage.

The habit of keeping records makes one more observant of all the little details that make the difference between success and failure. A certain amount of emulation is bound to result from comparing one cow with another. The attendants will take a pride in their cows, feed them better, and get better results from studying each cow as an individual performer.

The financial aspect after a few years is very gratifying, as higher prices are obtained for the progeny of the cows with a good record of merit, and the cows themselves are worth much more than those without a record of any kind.

Keeping of records and the use of the Babcock tester are everything in the dairying business. Do you weigh and test your milk? If not, start now.

(b) SELECT YOUR BULL.

By Alex. Mess, Dairy Supervisor.

Although the average farmer cannot afford to commence with a herd of pure-bred cows, he, on the other hand, should, at any reasonable cost, procure a pure-bred bull.

It should, of course, be the aim of every dairy farmer to improve his herd, and this aim may be hastened greatly by the use of a sire of undoubted milking strain. The old saying, "The bull is half the herd," should be taken to heart. If a farmer persists in using a cheap mongrel bull he is employing the very best means of courting disaster. And I am convinced that the use of inferior bulls is one of the very greatest hindrances to progress in dairy farming.

A bull should never be purchased simply because he has a pedigree, unless such pedigree proves that he has descended from ancestors who were possessed of undoubted dairy qualities and robust constitution. A bull of this class is never too dear.

Once the breed of your sire is chosen, stick to it through thick and thin; do not commence crossing and re-crossing. If indiscriminate breeding is persisted in no real success need ever be looked for, and it is the persistent crossing of all kinds of live stock that is the mischief of the whole live stock industry.

It is very foolish for a dairy-farmer to expect that he can improve his dairy herd by such a system. A good herd may be built up from cross-bred cows by the use of a pure-bred bull possessing an undeniable pedigree of performance, while the use of mongrel sires (which should have their roving propensities settled) as foundations bring about evils which take years to eradicate. It should be remembered whichever breed is chosen that to be successful requires the greatest care and attention on the part of the breeder.

EUCALYPTUS OIL.

F. R. Beuhne, Government Apiculturist.

As inquiries are frequently received as to the amount of oil obtainable from the different species of eucalypts, and only very expensive scientific books are available on the subject, it appears to be advisable to publish a list of the Victorian eucalypts under their common and also their botanical names, together with the percentage of oil and the amount in lbs. and ozs. obtainable per 1,000 lbs. of foliage.

It must, however, not be understood that those species containing the highest percentage of oil would be the most profitable in the commercial production of eucalyptus oil.

The oils of different species vary considerably in quality and in value. Some of the eucalypts with a high percentage of oil are large trees, and involve a considerably larger amount of labour and a greater amount of waste than some of the Mallee species, the foliage of which is easy to collect, and the oil, though not present in the highest percentages, is of finer quality.

There are, of course, other local factors, such as a supply of water, distance from railway, &c., which are not within the scope of this article.

Amount of oil obtained per 1,000 lbs. of foliage of 50 species of eucalypts as given by Baker and Smith in *Research on the Eucalypts.*

AMOUNT OF OIL OBTAINED PER 1,000 LBS. FOLIAGE.

Vernacular Name.	Botanical Name.	per. cwt.	lbs.	ozs.
1. Narrow-leaved Peppermint ..	*Eucalyptus amygdalina* ..	3·393	33	15
2. Broad-leaved Peppermint ..	.. *dives* ..	2·233	22	5
3. Red Mountain Ash	.. *Delegatensis* ..	1·760	17	10
4. River White Gum	.. *radiata* ..	1·641	16	7
5. White Top Gum	.. *vitrea* ..	1·480	14	13
6. Gully Gum	.. *Smithii* ..	1·434	14	5
7. Blue Mallee	.. *polybractea* ..	1·350	13	8
8. Spotted Blue Gum	.. *Maideni* ..	1·304	13	1
9. Mealy Stringybark	.. *cineria* ..	1·188	11	14
10. Green Mallee	.. *viridis* ..	1·060	10	10
11. Small Giant Mallee	.. *dumosa* ..	·999	10	0
12. Oil Mallee	.. *oleosa* ..	·970	9	11
13. Gippsland Box	.. *Bosistoiana* ..	·968	9	11
14. Slender Mallee	.. *caligcogona* ..	·901	9	0
15. *Mountain Gum*	.. *gonioocalyx* ..	·881	8	13
16. Giant Mallee	.. *incrassata* ..	·880	8	12
17. White Brittle Gum	.. *maculosa* ..	·846	8	7
18. Red Box	.. *polyanthemos*	·834	8	6
19. Sallow Gum	.. *camphora* ..	·836	8	6
20. Blue Gum	.. *globulus* ..	·745	7	7
21. White Stringybark	.. *eugenoides* ..	·742	7	7
22. Long-leaved Box	.. *elaephora* ..	·732	7	5
23. Messmate	.. *obliqua* ..	·677	6	12
24. Yellow Box	.. *melliodora* ..	·676	6	12
25. Scented Peppermint	.. *odorata* ..	·640	6	6
26. Peppermint Gum	.. *piperita* ..	·627	6	4
27. But But	.. *Bridgesiana* ..	·619	6	3
28. Bull Mallee	.. *Behriana* ..	·614	6	2
29. Lemon-scented Gum	.. *citriodora* ..	·586	5	14
30. Grey Box	.. *hemiphloia* ..	·554	5	9
31. Red Ironbark	.. *sidroxylon* ..	·537	5	6
32. Woolly Butt	.. *longifolia* ..	·535	5	6
33. Black Box	.. *bicolor* ..	·520	5	3
34. Forest Red Gum	.. *tereticornis* ..	·482	4	13
35. Hooked Mallee	.. *uncinata* ..	·433	4	5
36. Silver Top	.. *Sieberiana* ..	·421	4	3
37. Apple Gum	.. *Stuartiana* ..	·394	3	15
38. *Manna Gum*	.. *viminalis* ..	·354	3	9
39. River Red Gum	.. *rostrata* ..	·299	3	0
40. Black Sallee	.. *stellulata* ..	·293	2	15
41. Red Stringybark	.. *macrorryhncha*	·272	2	12
42. Brown Messmate	.. *hæmastoma* ..	·241	2	7
43. Swamp Gum	.. *paludosa* ..	·197	2	0
44. Spotted Gum	.. *maculata* ..	·169	1	11
45. Black Butt	.. *pilularis* ..	·130	1	5
46. Brown Stringybark	.. *capitellata* ..	·103	1	0
47. Grey Ironbark	.. *paniculata* ..	·088	0	14
48. Mahogany Gum	.. *botryoides* ..	·085	0	14
49. Blood Wood	.. *corymbosa* ..	·060	0	10
50. Candlebark Gum	.. *rubida* ..	·068	0	1

NOTE.—Numbers 16, 25, and 35 do not appear in Messrs. Baker & Smith's list and are taken from F. v. Mueller's Eucalyptographia.

THE *following is a good recipe for preparing grafting-wax, the chief* object of which is to exclude the air from the cuts on both stock and scion:—4 lbs. resin, 2 lbs. beeswax, 1 lb. mutton tallow. Dissolve over slow fire and apply warm. The wax should not be made hard enough to crack after being applied.

HORSE labour is a necessary item on the dairy farm, and should command much attention from the manager. If its efficiency drops the profits of the farm are decreased, and the profits from the cows must bear a loss in the horse labour item. It is seen then that successful dairying is not making a success with cows alone, but profitably combining a number of factors. Man, labour, and crop yields per acre are other important factors that can be controlled to a considerable extent by the manager.

AN EXPERIMENT TO SHOW EFFECT ON QUANTITY AND QUALITY OF MILK PRODUCED BY COWS WHEN MILKED AT EQUAL AND UNEQUAL PERIODS.

The results of two dairy experiments conducted at Offerton Hall, extending from May, 1912, until April, 1915, are here reproduced. The Durham County Council has set aside a sum not exceeding £120 a year for these investigations which it places at the disposal of Armstrong College, Newcastle-upon-Tyne. The extracts are from the Offerton *Bulletin*, No. 5 Report on further Experiments on the feeding of Dairy Cows at Offerton Hall, by Frank P. Walker, M.Sc., F.H.A.S., adviser in agriculture to the above College.—*Editor*

The exigencies of the new milk trade in many cases involve a great difference in the times between morning's and evening's milking periods. Apart altogether from the general feeding and management of a milking herd this difference in the time of milkings makes a considerable difference to the quality of the milk. It may be generally said that the longer the period between the milkings, the poorer the quality of the milk. Other experiments have shown that when the periods between the milkings more closely approximate than is the usual practice, the quality of the morning's and evening's milk is very similar. A previous experiment at Offerton Hall in 1905 confirmed this, but the experiment only lasted for a period of eighteen days. The object of these experiments was to see how far deductions based on a short trial would be confirmed when the experiments lasted over a considerably longer period, the cows being reversed during the later experiment.

For this experiment not quite so many cows in full milk were available as is usual, and it was felt that one or two of the stale milkers might not continue to milk throughout the experiments. As a fact it has to be recorded that one cow had fallen to a gallon a day by 2nd September, and was only giving 2 quarts per day at the end of the experimental period on 22nd September.

Experiments U and V lasted from 1st July to 22nd September inclusive during the summer of 1911.

Experiment U.

Preliminary Trials.—These trials lasted for a period of three weeks, and at the end of them the two lots of cows stood as follows:—

—	Total Yield in Pints per Lot per Day at end of Preliminary Trials.	Average Yield of Milk per Cow in Pints per Day.	Percentage of Butter-fat in Total Daily Yield.	Average Live-weight per Cow.
Lot I. ..	128·63	25·72	3·67	1,218 lbs.
Lot II. ..	128·44	25·68	3·66	1,142 lbs.

Rations.—As will be remembered the summer of 1911 was exceptionally hot and pastures became very bare. Throughout the experiments both lots of cows received per cow per day a mixture of 2 lbs. of soya bean cake, and 2 lbs. of Bombay cotton cake. After 10th July both lots received tares in addition, and on 24th July they were turned on to a clover fogg. On 2nd September, as tares were finished, the cows received a small amount per day of clover cut green, and after 9th September a very small quantity of turnips on the grass.

During the period of Experiment U, which lasted from 1st July to 11th August, the cows of Lot I. were milked at equal intervals of twelve hours each, viz.:—at 6 a.m. and 6 p.m., while those of Lot II. at unequal intervals of fourteen and ten hours respectively, viz.:—at 6 a.m. and 4 p.m.

Table LXXVI.—Average Quantity of Milk in Pints per Lot per Day for Six Weeks.

Week ending—	Lot I. Milked at 6 a.m. and at 6 p.m.			Lot II. Milked at 6 a.m. and at 4 p.m.		
	Morning.	Evening.	Total.	Morning.	Evening.	Total.
1911.						
7th July	53·5	58	111·5	61·5	54·5	116
14th July	53	54·5	107·5	60·5	48	108·5
21st July	49·5	53	102·5	57·5	48·5	106
28th July	47·5	51	98·5	56·5	49·5	106
4th August	48·5	51	99·5	57·5	48	105·5
11th August ..	44	47	91	55·5	45·5	101
Average per lot per day for each of six weeks	**49·33**	**52·41**	**101·75**	**58·16**	**49**	**107·16**

Results.—A fortnight elapsed between the end of the preliminary trials and the commencement of the actual experiment. Owing no doubt largely to the drought there was a considerable falling off in the average daily yield of the two lots.

Table LXXVI. shows the average weekly fluctuations in the two lots. *It is a striking fact that in every weekly average where in Lot I.* the cows were milked at equal intervals, the quantity of milk given at the evening's milking was always greater than that given during the morning. This result is also confirmed by Table LXXIX. in the succeeding experiment. On the other hand, whereas in Lot II., the hours of milking were uneven, the quantity of milk given at the morning's milking was always greater than at the evening. A result in agreement with general practice.

From a further study of Table LXXVI. it would appear that equal *milkings tended to decrease the actual flow of milk. This, however, is* not a fair deduction, inasmuch as one of the cows of Lot I. fell off her milk somewhat rapidly owing to advanced period of lactation, and in the following experiment in spite of the fact that these cows were then being milked at unequal intervals, the fall in the average weekly flow of this same group of cows was greater than in the other.

Table LXXVII.—Average Percentages of Butter-Fat in Milk for Each of Six Weeks.

Week ending—	Lot I. Milked at 6 a.m. and at 6 p.m.		Lot II. Milked at 6 a.m. and at 4 p.m.	
	Morning.	Evening.	Morning.	Evening.
1911.				
7th July	3·6	3·3	3·5	3·9
14th July	3·8	3·5	3·2	4·2
21st July	3·4	3·6	3	4
28th July	3·65	3·3	3	4
4th August	3·6	3·2	2·96	4
11th August	3·6	3·2	2·97	3·9
Average for each of six weeks	**3·6**	**3·35**	**3·07**	**4**
Times milkings were under the standard during six weeks	(—)	2	12	(—)
Highest	4·1	3·9	3·6	4·7
Lowest	3·1	2·7	2·4	3·6

	Lot I.	Lot II.
Average percentage of butter-fat in total daily yield ..	3·47	3·49
Total butter-fat in lb. per day	3·53	3·74

Quality of the Milk.—Table LXXVII. indicates that equal periods of milking are strikingly conducive to normal percentages of fat in both morning's and evening's milk. As is well known, there is often a great difficulty in getting the milk of cows up to the 3 per cent. of fat limit each morning. If by every means possible care be taken to equalize the intervals of milking there is no doubt that this would do away with a good deal of trouble and worry to those farmers who are anxiously desirous of producing milk of even quality. During a period of six weeks in no case in the morning in the group of cows constituting Lot I. was the milk below the recognised standard. Twice during the

evening it did fall below such a standard, but only just below. On twelve occasions in the morning, however, the milk of the group comprising Lot II. milked at unequal intervals fell below the 3 per cent. limit, and seriously so. Further, the average percentage of fat for the whole six weeks in equal periods of milking differs only by .25 per cent., whereas, this difference in the case of unequal periods of milking is equal to .93 per cent. The percentage of fat actually produced in the total daily yield is in the two groups practically the same.

TABLE LXXVIII.—AVERAGE PERCENTAGES OF SOLIDS NOT FAT IN MILK FOR EACH OF SIX WEEKS.

Week ending—	Lot I. Milked at 6 a.m. and at 6 p.m.		Lot II. Milked at 6 a.m. and at 4 p.m.	
	Morning.	Evening.	Morning.	Evening.
1911.				
7th July	9·1	9	9	8·8
14th July	8·8	9	8·7	8·7
21st July	8·8	9	8·8	8·7
28th July	8·7	8·7	8·7	8·6
4th August	9	9	8·8	8·8
11th August	8·9	8·9	8·8	8·7
Average for each of six weeks	**8·88**	**8·93**	**8·8**	**8·72**
Times milkings were under standard ..	(–)	(–)	1	2
Highest	9·4	9·4	9·2	9·3
Lowest	8·5	8·6	8·4	8·4

	Lot I.	Lot II.
Average percentage in total daily yield	8·9	8·75
Total solids not fat in lb. in daily yield	9·06	9·39

SOLIDS NOT FAT.—During the summer of 1911 frequent complaints were made that owing to the drought there was a tendency for the milk to fall below the standard of 8.5 per cent. in non-fatty solids. So far as this experiment goes Table LXXVIII. shows that this was not the case, as in practically all cases the milk was of normal quality. It is only fair to state that in the north the drought was not of such intensity as in the midlands and south. The cows, too, under experiment, as already shown, were receiving a fairly liberal supply of cakes together with vetches or clover cut for them.

Experiment V.

On 12th August those cows in Lot I. which, during the previous experiment, had been milked at equal intervals were for the following six weeks milked at unequal intervals, and those of Lot II., which had been milked at unequal intervals, were now milked at even intervals of twelve hours each.

RESULTS.—As regards the actual flow of milk Table LXXIX. shows that the cows constituting Lot I., and now milked at unequal intervals,

show a much greater decrease in the average weekly flow of milk than those comprising Lot II. This was no doubt due to the fact that one of these cows continued rapidly to go off her milk, as at the end of the experiment on 22nd September, she was only giving 2 quarts per day. This smaller flow of milk is therefore due to the individuality of the cows and not to the difference of the milking periods. On the other hand Table LXXIX. shows that the quantity of milk given at the *evening's milking, by equal milking periods is greater than at the* morning's milking. A result which strikingly confirms the one shown in the previous experiment.

Table LXXIX.—Average Quantity of Milk in Pints per Lot per Day for Six Weeks.

Week ending.	Lot I. Milked at 6 a.m. and at 4 p.m.			Lot II. Milked at 6 a.m. and at 6 p.m.		
	Morning.	Evening.	Total.	Morning.	Evening.	Total.
1911.						
18th August ..	45·5	40·5	86	48	49	97
25th August ..	45	37	82	44·5	47·5	92
1st September ..	42·5	35	77·5	45·5	47·5	93
8th September ..	38	30·5	68·5	42·5	43	85·5
15th September ..	35	29	64	41·5	43·5	85
22nd September ..	30	26·5	56·5	40	40	80
Average per lot per day for each of six weeks	**39·33**	**33·08**	**72·43**	**43·66**	**45·08**	**88·75**

Quality of the Milk.—If the deductions with regard to the more *even quality of morning's and evening's milk from equal periods made* from the previous experiment were sound, it would naturally be expected that when the milking periods were reversed for the two lots of cows the results of Experiment V would confirm the previous one. Table LXXX. shows this confirmation in a very satisfactory manner. In every case but one of Lot II. (equal periods) the percentage of fat is greater in the morning's milk than in the evening's. The actual *difference in favour of the better morning's milk for the average of the* six weeks is .18 per cent., while in the case of Lot I. (unequal milkings) the morning's milk is on the average of the whole period .68 per cent. poorer than the evening's. The differences are not quite so great as in the previous experiment, but, having regard to the more advanced period of lactation of both lots of cows, is quite consistent. This more advanced lactation period also no doubt partly explains why the actual *number of times the milk of cows in Lot I. (unequal periods) only fell* six times below the 3 per cent. limit in the morning as compared with twelve in the previous experiment, and once in Lot II. (equal periods) at an evening's milking as compared with twice in the previous experiment. The lowest percentage of fat with both lots of cows was further not so low as in the previous experiment.

TABLE LXXX.—AVERAGE PERCENTAGES OF BUTTER-FAT IN MILK FOR EACH OF SIX WEEKS.

Week ending—	Lot I. Milked at 6 a.m. and at 4 p.m.		Lot II. Milked at 6 a.m. and at 6 p.m.	
	Morning.	Evening.	Morning.	Evening.
1911.				
18th August	3·1	4	3·5	3·3
25th August	3	4	3·77	3·4
1st September	3·1	3·97	3·6	3·8
8th September	3·5	4·1	3·7	3·5
15th September	3·6	3·9	3·8	3·5
22nd September	3·6	3·8	3·9	3·7
Avarage for each of six weeks	**3·28**	**3·96**	**3·71**	**3·53**
Times milkings were under standard ..	6	(—)	(—)	1
Highest	4	4·5	4·3	4·6
Lowest	2·8	3·1	3·2	2·9

	Lot I.	Lot II
Average percentage of butter-fat in total daily yield ..	3·58	3·61
Total butter-fat in lb. per day	2·59	3·21

TABLE LXXXI.—AVERAGE PERCENTAGES OF SOLIDS NOT FAT IN MILK FOR EACH OF SIX WEEKS.

Week ending—	Lot I. Milked at 6 a.m. and at 4 p.m.		Lot II. Milked at 6 a.m. and at 6 p.m.	
	Morning.	Evening.	Morning.	Evening.
1911.				
18th August	8·8	8·7	8·7	8·7
25th August	8·7	8·5	8·3	8·5
1st September	8·7	8·7	8·6	8·7
8th September	8·7	8·7	8·6	8·6
15th September	8·7	8·7	8·7	8·6
22nd September	8·7	8·6	8·7	8·6
Average for each of six weeks	**8·72**	**8·65**	**8·62**	**8·62**
Times milkings were under standard ..	6	7	6	5
Highest	9·1	9·1	8·9	8·9
Lowest	8·2	8	8·1	8·2

	Lot I.	Lot II.
Average percentage in total daily yield	8·68	8·61
Total solids not fat in lb. in daily yield	6·29	7·64

SOLIDS NOT FAT.—As already mentioned in the previous experiment there was no very distinct evidence that the drought had seriously affected the percentage of solids not fat in the milk.

In other experiments it has happened that towards the end of the summer, and the commencement of the autumn season, when grass has naturally been poorer and scarcer, the solids not fat in milk have tended to be lower than ordinarily. From 12th August to 22nd September in 1911, in Table LXXXI. it is seen that on thirteen occasions in the case of Lot I. cows and on eleven occasions in that of Lot II. cows, the solids not fat fell below the 8.5 per cent. standard. The lowest percentage was 8. From these somewhat abnormal figures it is possible to deduce that the continued effect of the drought might have had some effect in influencing the quality of the milk, and that where drought effects were much more marked some foundation for complaints about low non-fatty solids may have had some justification.

Table LXXXII.—Average Live-Weight (in lb.) per Cow for Each Lot.

—	Commencement of Experiments.	25th July.	21st August.	21st September.	Increase (+) or Decrease (—) during Experiment.
Lot I.	1,218	1,233·4	1,241·8	1,254·4	+36·4
Lot II.	1,142·4	1,148	1,145·2	1,162	+20·8

General Conclusions.

1. It cannot be said that the total quantity of milk is influenced by the equal or unequal periods of milking.

2. So far as the percentage of fat in milk is concerned it is distinctly shown that the length of time between morning and evening milkings does very materially alter it.

3. The results distinctly emphasize the fact that one very important means of getting over the difficulty of poorer morning's milk is to endeavour to make the periods of milking as even as ever possible.

4. It is frequently asserted that the general public demand their milk at such times as to prevent the more general adoption of equal milking periods. If by these and similar experiments it can be shown to the public that equal milking periods produce more even quality of milk, they may in time be sufficiently sympathetic to help the milk producer to get over what is at present a very serious trouble to him.

5. The results again emphasize the necessity in cases of prosecution for selling milk below the standard to take into consideration the desirability of taking an evening as well as a morning sample of milk for analysis before such prosecution is pursued.

6. It is possible that while the percentage of fat remains practically normal under conditions of severe drought the "solids not fat" may be lowered somewhat.

7. In both experiments the cows of Lot I. gave slightly greater percentages of "solids not fat" in the milk. This was probably due to the individuality of the cows comprising this group.

8. The cows which were milked at even periods gave more milk in the evening than in the morning. The evening's milk was also slightly poorer in quality than the morning's. This is contrary to generally accepted experiences, as in ordinary farm practice unequal periods of milking are the rule.

NOTE ON THE VARIATIONS IN THE AMOUNT OF FAT IN MILK DUE TO VARIATIONS IN THE TIMES OF MILKING.

S. H. Collins.

In 1911* I deduced a formula from over 600 tests of milk, which showed that if cows were milked at 6 a.m. and 6 p.m. the evening's milk would be .2 per cent. fat poorer than the morning's milk. If the cows were milked at 6 a.m. and 5 p.m. then the evening's milk would be the richer to the extent of .3 per cent. fat. If milked at 6 a.m. and 4 p.m. the evening's would show .8 per cent. more fat, and if milked at 6 a.m. and 3 p.m. the evening milk would be 1.3 per cent. richer.

The best test of any similar law, based on averages, is to find out if it agrees with facts discovered after the rule has been established.

In the results explained by Mr. Walker it may be seen that in twelve weeks' trials the evening milk (6 p.m.) is poorer than the morning's (6 a.m.) by .25 per cent. fat with equal intervals of milking and that the evening milk (4 p.m.) is richer than the morning milk (6 a.m.) by .80 per cent. fat with unequal intervals. These results are almost exactly what the rule predicts, namely, .25 against .20 and .80 against .80. As regards the weeks taken one at a time, there is only one week with equal intervals, during which the experiment differed from the rule by more than .2 per cent., and there were only three weeks with unequal intervals where the experiment differed from the rule by more than .2 per cent.

If one milking was twelve minutes too late and the next milking twelve minutes too early, there would be a discrepancy of .2 per cent. fat, or the same discrepancy would result from a delay of twenty-four minutes from one milking, the other milk being at correct time. Since accurate timing is quite impossible, the few cases where the experiment appears to depart from the rule may be no departure at all, but merely be the result of the difficulty of accurate time-keeping.

These results confirm many previous ones in various parts of the country and prove conclusively that the percentage of fat in milk depends very largely on the times of milking and that the relationship between times of milking and percentage of fat is a constant one.

Table LXXXIII.—Average Effect of Times of Milking.

Hours of Milking.			Evening Milk will be—		
6 a.m.	..	6 p.m.	poorer by	·2 %	fat than the morning milk.
6 ,,	..	5.30 ,,	richer ..	·05 %	.. .. ..
6 ,,	..	5 ..	.. ..	·3 %	.. .. ..
6 ,,	..	4.30 ..	.. ..	·55 %	.. .. ..
6 ,,	..	4 ,,	.. ..	·8 %	.. .. ,,
6 ,,	..	3.30 ,,	,, ,,	1·05%	.. ,, ,,

* Proceedings of the University of Durham Philosophical Society, Vol. iv., Part 1.

CHAMPION BUTTER-FAT TEST AT THE ROYAL SHOW.

R. T. Archer, Senior Dairy Inspector.

For the first time for many years at the Annual Show of the Royal Agricultural Society, this year a class was instituted for the cow giving the most butter-fat. The competition extended over three days (six consecutive milkings). The conditions were as follow:—

The Weekly Times Champion Butter-fat Test.—Special prizes. First prize, £12; second prize, £8; third prize, £5 (presented by *The Herald* and *Weekly Times* Ltd.).

Each competitor will be allowed three entries in each class, and may nominate a maximum number of ten cows, paying a fee of 1s. per cow at time of entry. The exhibitor may compete with any cow or cows selected from those which he has nominated. The names of all cows nominated must be stated on entry form.

Cow (any pure breed) giving the best butter-fat results under the Babcock test. All exhibits must have been the property of the exhibitor three months before the date of entry. Cows to be milked dry in the presence of the stewards or judges, or whom they may appoint, on Friday, 22nd September, 1916, at 5 p.m., when the exhibits must be in the yards, such milking not to be taken into account. They will be milked at 7 a.m. and 5 p.m. on Saturday, Sunday, and Monday, 23rd, 24th, and 25th September; the milk produced will be subjected to a Babcock test, and the prizes awarded in accordance with the results obtained.

Although it is recognised that as a rule cows will not give their best results at a show in strange surroundings, a perusal of the figures given below will indicate that the competitors gave an excellent account of themselves. The arrangements under which the competing cows were maintained during the contest were favorable, for, although they were in the main cattle pavilion, they were in one corner of the building, and in a wire-netting enclosure, which excluded traffic likely to disturb.

Only five cows were presented for the contest. Two Ayrshires, the property of Mr. Andrew Buchanan, of Gleneira, Flinders, and three red polls, the property of the Department of Agriculture, Central Research Farm, Werribee. The winner was the red poll "Pipio," with 134 lbs. 3 ozs. of milk, an average of 44 lbs. 11 ozs., and 6.222 lbs. butter-fat, thus making 2.074 lbs. of butter-fat per day. On the first evening she gave a higher test than on the two following evenings. The second cow was the Ayrshire, "Lady Mac of Gleneira." She also gave over 2 lbs. of butter-fat per day, and was improving each day, and had the competition extended over another day she would probably have turned the tables on her competitor. "Lady Kyle" of Gleneira was third, with an average of 1.9 lb. of butter-fat per day. "Lady Kyle" gave the most milk, an average of 48 lbs. 3 ozs. per day. "Lady Mac" is by Majestic of Oakbank, by the famous Jamie of Oakbank. Very considerable interest was taken by breeders in the competition, and it is anticipated that next year a large number of entries will result.

The milking operations and collection of samples were carried out by myself, assisted by Mr. B. A. Barr, and the determination of butter fat under the direction of Mr. P. R. Scott, Chemist for Agriculture.

The complete return is as under:—

THE RESULT OF MILKING COMPETITION FOR THE "WEEKLY TIMES" CHAMPION BUTTER-FAT TEST.

No.	Name.	Morning.			Evening.			Total Milk.	Composite Test.	Total Fat.
		Milk.	Test.	Butter Fat.	Milk.	Test.	Butter Fat.			
	23.9.16.	lbs. ozs.	%	lbs.	lbs. ozs.	%	lbs.	lbs. ozs.	%	lbs.
1	Sumatra	23 7	6.1	1.429	15 11	5.55	0.870	39 2	5.61	2.299
2	Pipio	24 6	4.55	1.109	20 2	6.0	1.207	44 8	5.21	2.316
3	Lady Mac of Gleneira	23 14	3.8	0.907	19 5	4.7	0.907	43 3	4.20	2.144
4	Muria	20 2	6.5	1.308	12 14	6.5	0.836	33 0	6.50	1.814
5	Lady Kyle of Gleneira	25 15	3.2	0.830	19 1	4.4	0.838	45 0	3.71	1.668
	24.9.16.									
1	Sumatra	22 13	3.95	0.901	15 13	4.3	0.679	38 10	4.09	1.580
2	Pipio	25 11	4.1	1.053	19 7	4.65	0.903	45 2	4.34	1.956
3	Lady Mac of Gleneira	25 10	3.9	0.990	20 9	4.6	0.945	46 3	4.21	1.944
4	Muria	18 11	5.15	0.962	13 12	5.9	0.811	32 7	5.47	1.773
5	Lady Kyle of Gleneira	27 8	3.8	1.045	20 6	4.35	0.886	47 14	4.03	1.931
	25.9.16.									
1	Sumatra	23 0	3.8	0.874	15 14	4.2	0.666	38 14	3.96	1.540
2	Pipio	25 13	4.0	1.032	18 12	4.9	0.918	44 9	4.38	1.950
3	Lady Mac of Gleneira	28 4	3.7	1.045	20 4	5.2	1.053	48 8	4.33	2.098
4	Muria	17 15	5.0	0.896	13 11	5.9	0.807	31 10	5.39	1.703
5	Lady Kyle of Gleneira	30 14	3.8	1.173	20 13	4.5	0.936	51 11	4.16	2.109

Name.	Grand Total.	
	Milk.	Butter Fat.
	lbs. ozs.	lbs.
1st Pipio (Red Poll)	**134 3**	**6.222**
2nd Lady Mac of Gleneira (Ayrshire) ..	**137 14**	**6.188**
3rd Lady Kyle of Gleneira (Ayrshire) ..	**144 9**	**5.708**
4th Sumatra (Red Poll)	**116 10**	**5.419**
5th Muria (Red Poll)	**97 1**	**5.280**

BREAKING IN HEIFERS.

The breaking in of heifers to the pail is a very important stage in the life of a cow, as upon the management of her at this time depends to a great extent her usefulness as a dairy cow. A writer in the "Farmer and Stockbreeder" points out that if she is badly broken in it will result in her always being fidgety and troublesome at milking time, moving constantly and kicking at her milker. A cow that behaves thus, unless intrusted to a very conscientious and persevering person to milk, is seldom stripped properly, as after a time the milker's patience becomes exhausted, besides which he is apt to stop operations prematurely for fear of the cow turning the full bucket of milk over for the sake of his wanting to extract the last few drops. Moreover, a cow that is irritable and nervous when being milked does not usually let her milk down freely, which habit tends to diminish the supply.

Of course there are a few cows which are naturally not of a placid disposition, and which, even with careful treatment, are nervous and fidgety. But it is more often than not due to insufficient care and patience being exercised when they calve down for the first time. It often happens that down-calving heifers have been grazing on some outlying land, where they seldom see a living soul, and the change from this to a domesticated life when they calve is more than alarming for the heifer. It is not surprising that endless trouble is experienced before they can be taught to stand quietly and be milked. It is far the wisest plan to adopt to bring a heifer up to the farm and let her be tied up with the rest of the milking herd a month or so before she is due to calve. She will then at least be accustomed to the subjection of a chain. During the time which elapses before she calves she should be handled and tamed as much as time permits.

After calving, when suckling her calf, she should have her teats drawn occasionally, and if she is giving more milk than the calf requires, it is a good opportunity to begin milking her, and to do it at the same time as the calf is sucking. She is almost sure to stand quietly while the calf is taking his share, and this will use her to the sensation of being hand-milked almost without her having realized what has taken place. For the first few times it is better not to put a pail under her, but milk on the ground.

STANDARD TEST COWS.

QUARTERLY REPORT FOR PERIOD ENDED 30th SEPTEMBER, 1916.

Altogether 60 cows completed, of which fifteen failed to yield the quantity of fat requisite for a certificate. Unfortunately some cows have again to be left out of the return owing to owners' omission to attend to their registration. The test is confined to pure-bred stock, and only those animals entered in a recognised herd book are eligible, therefore it is necessary for satisfactory evidence to be submitted that any animal tested has been accepted into a herd book before such cow's name, and her return can be published. By omitting to do this, owners

are handicapped to the extent indicated. The following new herds have entered the test:—

T. Mesley, Dalyston (Jersey).
E. Hayes, Archie's Creek (Jersey).
Geo. Rowe, Kardella (Jersey).
J. Scott, East Geelong (Jersey).
W. C. Greaves, Monomeith (Ayrshire).
A. Jackson, Glen Forbes (Jersey).

Individual returns are as follow:—

A. BOX, Hiawatha. (Jersey.)

Completed, 5. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Roseneath Fox's Twylish	3775	8.11.15	15.11.15	273	4	5,735¼	5·19	297·72	250	339¼
Laurie	3043	23.11.15	30.11.15	273	12½	5,313½	5·16	274·40	250	312¾

F. CURNICK, Malvern. (Jersey.)

Completed, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Eva	3770	18.10.15	25.10.15	273	19	6,777	4·70	318·90	250	363½

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll.)

Completed, 8. Certificated, 7.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Europa	Not yet allotted	29.9.15	6.10.16	273	11	7,425	4·46	331·20	250	377½
Gallipoli	"	30.9.15	7.10.15	273	14½	6,771¼	4·27	289·01	175	329½
La Belle France ..	"	30.9.15	7.10.15	273	19	6,119½	4·50	275·28	175	313¾
Britannia ..	"	6.10.15	13.10.15	273	12½	6,887	4·10	282·26	250	321¾
Egypta	"	17.9.15	17.10.15*	273	15	6,887	4·03	277·41	250	316½
Mahratta ..	"	20.10.15	27.10.15	273	12½	4,999½	4·89	244·69	175	279
Laurel	"	29.11.15	6.12.15	273	13	5,683½	3·66	208·15	200	237¼

* Entry deferred three weeks owing to attack of mammitis.

GEELONG HARBOUR TRUST, Marshalltown. (Ayrshire.)

Completed, 2. Certificated, Nil.

A. W. JONES, Whittington. (Jersey.)

Completed, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Silver Queen II ...	Not yet allotted	27.8.15	*3.10.15	273	6	4,801½	6·38	306·80	200	349¾
Dolly	3754	3.12.15	10.12.15	273	19	6,838	6·63	453·38	250	516¾

* Entry deferred one month.

C. G. KNIGHT, Cobram. (Jersey.)

Completed, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Royal Rose ...	2585	29.9.15	6.10.15	273	14½	6,518½	5·83	379·78	250	433
Christmas ...	Not yet allotted	18.10.15	25.10.15	273	11½	3,521¼	5·42	190·86	175	217½
Princess of Tarnpirr	2986	29.10.15	5.11.15	273	6½	5,744	4·67	268·49	250	306
Idyll's Morocco ...	Not yet allotted	18.11.15	25.11.15	273	16	4,025¼	4·87	196·04	175	223½

AGRICULTURAL HIGH SCHOOL, Leongatha. (Jersey.)

Completed, 6. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Mona	155 C.S.H.B.	18.10.15	28.10.15*	†217	11	5,509	4·78	263·55	200	300¼
First Choice ...	372 C.S.H.B.	28.10.15	4.11.15	207	4¾	2,886¼	6·33	182·64	175	208¾

* Entry deferred three days through weights not being available.
† No weights furnished after 31st May.

C. G. LYON, Heidelberg. (Jersey.)

Completed, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Silvermine IV ..	716	4.11.15	11.11.15	269	18	7,415	4·92	364·77	250	415¾
Ellie IV... ..	2889	26.12.15	2.1.16	273	18	8,933½	4·45	397·65	250	453¼
Lassie II. ..	1136	26.12.15	2.1.16	273	17½	8,055¾	4·91	395·30	250	450¼

MUHLEBACH BROS., Batesford. (Ayrshire.)

Completed, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Gracious of Glenarthur	2324	28.9.15	*8.10.15	265	4	6,313¼	4·11	259·39	250	295¾
Marjorie of Retreat	2963	13.10.15	20.10.15	273	8½	7,239½	4·63	335·07	250	382

* *Entry deferred three days owing to yields not being recorded.*

D. SADLER, Camperdown. (Ayrshire.)

Completed, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Get of Kilmarnock	3092	12.10.15	19.10.15	*268	21	7,088	4·05	287·00	175	327¼
Lady Loch of Kilmarnock	3095	14.10.15	21.10.15	243	4½	4,881¼	4·28	209·01	200	238¼

* *Yields not recorded after 12th July.*

C. FALKENBERG, Elliminyt. (Jersey.)

Completed, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Fancy of Elliminyt	*Not yet allotted*	22.10.15	29.10.15	273	10	4,932	4·57	225·41	200	257

W. WOODMASON, Malvern. (Jersey.)

Completed. 21. Certificated, 20.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Daisy VI. of Melrose	Not yet allotted	3.10.15	10.10.15	273	9	5,459½	5·10	279·99	200	319¼
Chevy VII. ..	3636	12.10.15	19.10.15	273	12	4,725¼	5·77	272·84	250	311
Lassie Fowler V. of Melrose	Not yet allotted	19.10.15	26.10.15	273	12	3,764½	5·62	211·64	175	241¼
Peerless IX. of Melrose	,,	19.10.15	26.10.15	273	11½	4,544½	5·25	238·56	175	272
Pearl II. of Melrose	3670	25.10.15	1.11.15	273	12½	5,770¼	5·45	314·45	250	358¼
Vanilla VII. of Melrose	Not yet allotted	26.10.15	2.11.15	273	14	5,315	5·90	313·89	175	357¾
Jessie V. of Melrose	3652	30.10.15	6.11.15	273	19	7,452¼	5·25	391·51	250	446¼
Flower VI. of Melrose	3641	2.11.15	9.11.15	273	21	7,109½	5·50	390·72	250	445½
Peerless VI. of Melrose	3671	6.11.15	13.11.15	273	11	6,199½	5·65	350·54	250	399½
Handsome Girl VIII. of Melrose	Not yet allotted	8.11.15	15.11.15	273	15	4,971	6·13	304·81	175	352
Rarity VII. of Melrose	,,	8.11.15	15.11.15	273	14	5,181	4·91	254·49	175	290
Chevy VIII. of Melrose	,,	10.11.15	17.11.15	273	20½	5,686½	6·05	344·08	200	392¼
Quality VI. of Melrose	3674	11.11.15	18.11.15	273	24	8,327	5·24	436·73	250	497¾
Blossom III. of Melrose	3633	19.11.15	26.11.15	273	16	6,631	4·18	277·22	250	316
Edith II. of Melrose	Not yet allotted	27.11.15	4.12.15	273	18½	6,630½	4·73	313·79	200	357¾
Mystery XII. of Melrose	3667	27.11.15	4.12.15	273	16	6,628	5·15	341·40	250	389¼
Rarity VI. of Melrose	3675	29.11.15	6.12.15	273	18½	8,070½	4·92	396·77	250	452¼
Daisy V. of Melrose	3637	12.12.15	19.12.15	273	17½	6,558	5·30	347·81	250	396¼
Pleasance V. of Melrose	Not yet allotted	21.12.15	28.12.15	273	17½	4,505	5·25	236·53	200	269¼
Fuchsia X. of Melrose	,,	24.12.15	31.12.15	273	21	7,553½	4·26	321·56	200	366½

C. D. LLOYD, Caulfield. (Jersey.)

Completed, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Countess Twylish ..	928	22.10.15	29.10.15	273	16	7,140	5·02	358·48	250	409¾

SAVING FEMALE STOCK—AN ENGLISH OPINION.

All over the United Kingdom, states a contributor to the "Mark-lane Express," flock masters are talking of the especially high prices being realized by sheep, the best making well over 1s. per pound, a price the equal of which has not been enjoyed by the present race of flock owners. "What a profitable occupation this must be," one has heard time after time from the amateur or the urban dweller. "To sell sheep at the price at which they are being sold must mean an enormous profit." The English writer points out that it is not by any means the case that the increased price per pound represents an equal amount of increased profits. Not only are store sheep, which, after all, are the stock-in-trade of the grazier, equally expensive to buy, but every commodity that is needed to produce fat sheep has increased in like measure, and it is more than probable that the profits derivable at the moment by the flock owners are none too large, considering the increased risk and cost incurred.

At the present time, in Australia, it is interesting to note that the English writer remarks that what, perhaps, is of the most serious moment, both for the flock owner and for the country at large, is the danger of a larger number of breeding ewes, or those that become breeding ewes, being slaughtered. It is a big temptation, he remarks, to many a man to know that his ewe tegs, which ought to be kept on to be added to the flock, are worth the money that is so readily paid by the butcher. Far too many, this writer fears, will be tempted to realize and to trust to Providence to replace at a later date.

The same writer says:—"Much was heard last season about the stoppage of the slaughter of ewe lambs. We have heard nothing—or comparatively nothing—this season; yet the need of its emphatic enforcement is far more paramount now than twelve months ago. One has only to look to the moderate supply of mutton to realize the seriousness of the position, for during last month, April, 1916, we actually imported less mutton than we did during that month in the year 1895 by some 34,000 cwt.; yet during the past twenty-five years the population of this country has so largely increased, and the sheep population so strikingly decreased. The position at the moment is the smallest supply of foreign and colonial mutton received for twenty-five years, and the smallest available supply of home grown and fed mutton that we have known for years past."

A leading authority said at a meeting of the Royal Agricultural Society of England twelve months since that the British farmer was able to look after himself; he needed no one to guide him, and if it paid him to breed sheep he would breed them, &c. "That doctrine," the "Mark-lane Express" writer adds, "is all very well, but the British farmer represents but one section of a big community, and it is only reasonable and right that that community should take care to look after its best interests, and those interests unquestionably at the present time require that every sheep capable of being added to the breeding stock of this country should be saved, and none slaughtered either as lambs, or yearlings, or any other age, except such as are barren, toothless, or otherwise defective and undesirable for breeding purposes."

VICTORIAN RAINFALL.

Third Quarter, Year 1916.

District.	—	July.	August.	September.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North ..	District Mean ..	145	245	308	698
	Normal	90	104	128	322
	Per cent. above normal	61	136	141	117
	„ below „	..	..	..	..
Mallee South ..	District Mean ..	178	210	333	721
	Normal	116	128	140	384
	Per cent. above normal	53	64	138	88
	„ below „	..	..	..	..
North Wimmera ..	District Mean ..	225	301	321	847
	Normal	154	171	176	501
	Per cent. above normal	46	76	82	69
	„ below „	..	..	..	..
South Wimmera ..	District Mean ..	252	310	323	885
	Normal	207	216	217	640
	Per cent. above normal	22	44	49	38
	„ below „	..	..	..	..
Lower Northern Country	District Mean ..	239	249	459	947
	Normal	152	164	152	468
	Per cent. above normal	57	52	202	102
	„ below „	..	..	..	..
Upper Northern Country	District Mean ..	287	287	605	1,179
	Normal	184	196	183	563
	Per cent. above normal	56	46	231	109
	„ below „	..	..	..	..
Lower North-East ..	District Mean ..	601	477	435	1,513
	Normal	284	257	258	799
	Per cent. above normal	112	86	69	89
	„ below „	..	..	..	..
Upper North-East ..	District Mean ..	788	807	729	2,324
	Normal	456	437	427	1,320
	Per cent. above normal	73	85	71	76
	„ below „	..	..	..	..
East Gippsland ..	District Mean ..	379	171	632	1,182
	Normal	234	209	275	718
	Per cent. above normal	62	..	130	65
	„ below „	..	18	..	..
West Gippsland ..	District Mean ..	193	325	722	1,240
	Normal	290	305	353	948
	Per cent. above normal	..	7	105	31
	„ below „	33	..	..	..

VICTORIAN RAINFALL—*continued.*

District.	—	July.	August.	September.	Quarter.
		Points.	Points.	Points.	Points.
East Central	District Mean.. ..	219	356	792	1,367
	Normal	282	283	326	891
	Per cent. above normal	..	26	143	53
	,, below ..	22	..	..	..
West Central	District Mean.. ..	209	241	922	1,372
	Normal	194	200	251	645
	Per cent. above normal	8	20	267	113
	,, below ..	..	..	..	..
North Central ..	District Mean.. ..	329	441	698	1,468
	Normal	258	258	264	780
	Per cent. above normal	28	71	164	88
	,, below ..	..	..	..	..
Volcanic Plains ..	*District Mean* ..	237	273	544	1,054
	Normal	220	229	273	722
	Per cent. above normal	8	19	99	46
	,, below ,,	..	..	..	..
West Coast	District Mean.. ..	254	387	415	1,056
	Normal	328	314	325	967
	Per cent. above normal	..	23	28	9
	,, below ..	23	..	..	..

N.B.—100 points = 1 inch.

9th October, 1916.

July rains were very heavy in the northern parts of the State, and somewhat below average in southern areas; but, on the whole, the rains were generally of a useful nature, and were much more than were required in the North-Eastern districts. They were mostly the effects of combined antarctic and tropical influences, and consequently were most heavy in the eastern parts, causing floods on the Ovens River. Stock were generally in good condition throughout, there being an abundance of feed, and lambing results exceptionally favorable. In the Lismore district and neighbouring plains, and also in the vicinities of Geelong and Werribee, a partial drought has taken place, and crops appear to be at a standstill, and quite a contrast compared with the ideal conditions that prevail elsewhere. Wet and humid weather generally were the chief characteristics of August, the whole State received an abundant rainfall, more particularly north of the Dividing Range, the great storms being mainly tropical. Most of the rivers were in flood, and although crop prospects were excellent, a superabundance of moisture had diminished the prospective yield here and there in northern districts. The Werribee to Geelong, and almost to Ballarat farmers were still experiencing the effects of the drought in those parts, and more rain was needed. Stock throughout were in excellent condition.

September was remarkable for its heavy and continuous rains during the latter part of the month, and as all rivers were in flood, much anxiety was felt especially on the Murray tributaries, and much damage to crops and loss of stock resulted. In the central district where in parts crop prospects were far from bright the heavy rains caused a more cheerful outlook, and here, as elsewhere, not including some places where flooding had damaged growth, the expected results of the approaching harvest seemed to be of at least as cheerful a character as they were twelve months ago, and promised to outstrip even the record crops of last year. Stock were excellent throughout the State. Balook, in Gippsland, holds the record for the greatest monthly rainfall, viz., 22.25 inches, and Melbourne's total, 7.93 inches, established a record for any month during the past sixty-one years.

H. A. HUNT,
Commonwealth Meteorologist.

3rd November, 1916.

To Bottle Peas.—The peas must be gathered while young. Choose those of a good cooking variety, shell them, and immediately throw them into boiling water to which some salt has been added. Allow the peas to boil two minutes, then strain, and fill the bottles with the peas and the water in which they were boiled. Place the glass stoppers loosely on the bottles, then stand them in the sterilizer, the water in which should be warm; gradually bring to the boil, and allow them to boil for five minutes. Take out the bottles and screw down quickly.

A LEGAL decision was recently given in an English court as to when a lamb becomes a sheep. The question arose out of the killing of some sheep on a railroad by a passing train, and it was denied that the complaint was properly made, the animals being lambs, and not sheep. The judge decided that the lambs ceased to be lambs and became sheep as soon as they acquired their first pair of permanent teeth. Apparently he did not consider the question of when a lamb became a hogget, which, generally speaking, is between the time the lamb is weaned and when it is shorn.

THE recent outbreak of foot-and-mouth disease in the United States has proved the most serious the country has ever experienced. Up to 1st January it had cost the Government over £400,000, and about £500,000 of Federal Government funds were available a month or so ago for use in the eradication of the disease. Up to the end of 1914 101,000 animals had been slaughtered, which had cost the Government about £350,000 in reimbursements to the owners for their losses. The most serious trouble has been in Illinois, her loss to 1st January being 37,000 animals altogether. Pennsylvania is next, with nearly 18,000 head, and Ohio third, with a little over 10,000 head.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917.

Commenced 15th April, 1916; concluding 14th April, 1917.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.10.16	15.10.16 to 14.11.16	Total to Date (Seven months).	Position in Competition.
		LIGHT BREEDS.				
		Wet Mash.				
1	G. McDonnell	White Leghorns ..	772	144	916	1
10	J. H. Duncan	,, ..	760	150	910	2
13	H. J. Meaddows ..	,, ..	751	149	900	3
36	E. W. Hippe	,, ..	730	152	882	4
7	C. J. Jackson	,, ..	728	139	867	5
40	A. Brundrett	,, ..	716	147	863	6
41	Excelsior Poultry Farm ..	,, ..	714	146	860	7
37	J. M. Smith	,, ..	707	151	858	8
25	A. H. Mould	,, ..	740	116	856	9
22	Mrs. H. Stevenson ..	,, ..	706	147	853	10
38	V. Little	,, ..	710	138	848	11
3	W. M. Bayles	,, ..	687	158	845	12
28	S. Cheatle ..	R.C.B. Leghorns ..	690	148	838	13
44	J. Jamieson	White Leghorns ..	685	143	828	14
15	G. Laughlan	,, ..	687	141	828	
17	W. G. Swift	,, ..	685	138	823	16
27	John Blacker	,, ..	679	124	803	17
45	C. H. Oliver	,, ..	661	131	792	18
32	N. Burston	,, ..	648	144	792	
23	T. A. Pettigrove ..	,, ..	654	137	791	20
14	W. R. Hustler	,, ..	656	133	789	21
39	L. McLean	,, ..	636	147	783	22
24	Mrs. H. N. H. Mirams ..	,, (5 birds)	666	114	780	23
29	A. S. Hyndman ..	,, ..	614	156	770	24
12	G. Hayman	,, ..	624	145	769	25
11	R. W. Pope	,, ..	621	146	767	26
18	C. Ludwig	,, ..	630	137	767	
8	E. A. Lawson	,, ..	601	162	763	28
34	F. G. Silbereisen ..	,, ..	632	127	759	29
43	S. Buscumb	,, ..	597	160	757	30
30	F. T. Demmer	,, ..	636	116	752	31
16	F. Collings	,, ..	617	134	751	32
6	J. J. West	,, ..	619	132	751	
26	Mrs. A. Dumas	,, (5 birds)	602	136	738	34
101	A. E. Silbereisen ..	,, (5 birds)	595	124	719	35
19	Benwerren Egg Farm ..	,, ..	562	138	700	36
5	W. G. Osburne	,, ..	526	140	666	37
35	Tom Fisher	,, ..	493	152	645	38
20	H. I. Merrick	,, ..	493	129	622	39
33	E. F. Evans	,, ..	484	131	615	40
9	W. H. Clingin	,, ..	482	129	611	41
4	Fulham Park	,, ..	439	149	588	42
31	J. H. Gill	,, ..	408	151	559	43
		Total ..	27,343	6,029	33,372	
		HEAVY BREEDS.				
		Dry Mash.				
98	Marville Poultry Farm ..	Black Orpingtons ..	795	121	916	1
97	D. Fisher	,, ..	736	130	866	2
100	Oaklands Poultry Farm ..	,, ..	734	126	860	3
94	Mrs. H. Coad	,, ..	619	107	726	4
95	Mrs. T. W. Pearce ..	,, ..	619	101	720	5
96	H. Hunt	,, ..	542	136	678	6
99	J. Ogden	,, ..	397	103	500	7
		Total ..	4,442	824	5,266	

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916–1917—*continued.*

LIGHT BREEDS.

DRY MASH.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.10.16	15.10.16 to 14.11.16	Total to Date (Seven months).	Position in Competition.
46	W. H. Robbins ..	White Leghorns ..	840	147	987	1
52	W. J. Thom	.. ..	814	165	979	2
59	T. A. Pettigrove ..	.. ..	810	124	934	3
53	W. N. O'Mullane ..	.. ..	770	159	929	4
70	G. Wilkinson	.. ..	743	143	886	5
54	Mrs. A. O. Hughes ..	.. ..	718	151	869	6
47	H. McKenzie and Son ..	.. ..	736	130	866	7
58	C. Ludwig	.. ..	744	110	854	8
65	Izard and Tierney ..	.. ..	712	136	848	9
56	Mrs. Nicoll	.. ..	737	110	847	10
62	*H. W. Morrow*	.. ..	686	*131*	817	*11*
69	E. A. Lawson	.. ..	657	152	809	12
55	Rev. J. Mayo	.. ..	652	157	809	
61	C. C. Dunn	.. ..	696	105	801	14
48	Thirkell and Smith ..	.. ..	643	134	777	15
60	A. Greenhalgh	.. ..	624	149	773	16
67	Lysbeth Poultry Farm ..	.. ..	621	150	771	17
63	N. Burston	.. ..	610	159	769	18
66	Benwerren Egg Farm ..	.. ..	555	157	712	19
50	Clevedon Poultry Farm ..	.. ..	549	144	693	20
49	C. Lane	.. ..	565	127	692	21
51	*Reliable Poultry Farm* ..	.. ..	*549*	142	*691*	22
64	A. Bannett	.. ..	499	140	639	23
68	W. G. Osburne	.. ..	452	131	583	24
		Total	15,982	3,353	19,335	

HEAVY BREEDS.

WET MASH.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.10.16	15.10.16 to 14.11.16	Total to Date (Seven months).	Position in Competition.
74	Oaklands Poultry Farm ..	Black Orpingtons ..	859	122	981	1
89	Brooklyn Poultry Farm ..	.. ..	761	105	866	2
87	S. Buscumb	.. ..	749	114	863	3
92	J. H. Wright	.. ..	720	128	848	4
86	C. Ludwig	.. ..	716	131	847	5
85	Mrs. M. Coad	.. ..	733	105	838	6
80	Mrs. T. W. Pearce ..	.. ..	705	122	827	7
90	*Excelsior Poultry Farm* ..	.. ..	681	134	815	8
88	A. D. McLean	.. ..	702	96	798	9
83	L. McLean	.. (5 birds)	690	96	786	10
91	N. Papayanni	.. ..	649	125	774	11
93	L. W. Parker	.. ..	649	114	763	12
72	Marville Poultry Farm ..	.. (5 birds)	651	90	741	13
78	Reliable Poultry Farm ..	.. (4 birds)	637	87	724	14
77	Mrs. G. R. Bald ..	White Plymouth Rocks	589	123	712	15
81	K. Courtenay	Faverolles ..	565	137	702	16
71	C. E. Graham	Black Orpingtons ..	532	131	663	17
84	*H. L. Trevana*	*Rhode Island Reds*	535	128	663	
76	L. A. Errey	Silver Wyandottes	511	98	609	19
73	E. W. Hippe	Rhode Island Reds	513	68	581	20
82	J. Ogden	Black Orpingtons ..	469	112	581	
75	Mrs. Drake	Rhode Island Reds	427	113	540	22
		Total ..	14,013	2,479	16,522	

REPORT.

The weather conditions for the past month have been very bad for egg production, being especially severe on birds in open yards. All houses have been disinfected and supplied with clean straw during the month, with a view to additional comfort for the birds. The egg yield is somewhat lower than for the corresponding term last year, which is to be expected. Broodies have been plentiful lately, the Leghorns transgressing in this respect, being more numerous than usual. Rainfall for month 355 points. Temperature, lowest, 43 deg. Fahr.; highest, 78 deg. Fahr.

A. HART,
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Melbourne, Victoria.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

As a preventive against codlin moth, apple and pear trees should be sprayed with arsenate of lead whenever there is danger from the prevalence of the moth. One of the secrets of success in codlin moth spraying is the destruction of as many as possible of the insects of the first brood. Thus, if particular care is given to the early sprayings, keeping the fruit covered with spray for a month or six weeks after setting, this result is easily accomplished. Some growers prefer to gather all fruit infected by the first brood, spraying only for the second and later broods. Even if all the fruits attacked are gathered, which very rarely happens, the grower suffers from the loss of fruit, which he can ill afford, unless his crop be a heavy one.

Another feature for consideration is the fact that the presence of any arsenical spray on the foliage is responsible for the destruction of the pear and cherry slug, root-borer beetle, and all forms of leaf-eating insects.

Spraying the cherries for the slug will now be necessary. Arsenate of lead may be used, provided the fruit is not far advanced. Hellebore, and also tobacco water, are effective against this pest.

CULTIVATION.

All orchard soils should be kept well worked during the summer months. It is very essential that the trees should have an abundant supply of moisture during the whole of the growing season. The incessant rains that have fallen during the past months have given the subsoil a splendid soaking, which will benefit the trees considerably, and although the rain has very considerably interfered with the setting of

the fruit crops, it will be very beneficial in the promotion of a vigorous growth to the trees. This will mean an increased supply of fruit buds for the next season, consequently the frequent summer cultivation of the soil will be a necessity if the health and vigour of the trees are to be maintained.

Excessive transpiration is often the cause of loss of young trees and of new grafts. They are found to part with a large amount of moisture, and are not able to obtain or retain sufficient for their nourishment: they then very soon wither and die. The soil around these should always be kept well stirred; they may also be given a good straw or grass mulching, and an occasional overhead sprinkling will greatly benefit them.

The planting out of citrus trees may be continued, sheltering the tender plants from winds with hessian or breaks of scrub.

The general aims in summer cultivation should be to keep up a good loose earth mulch during the whole season, and to keep down all weeds and useless orchard growths.

Pruning.

Summer pruning may now be commenced, particularly on apple, pear, and plum trees. The removal or reduction of surplus leader growths, the shortening of unduly long laterals, and the thinning out of crowded shoots, will all tend to strengthen other parts of the tree, and to increase the development of new fruit buds.

The Vegetable Garden.

Tomatoes will require a good amount of attention at this time of the year. If the plants have been well looked after, they should be making vigorous growth. It will be to advantage to tie the plants to stakes, training them to two or three main growths, and pinching out all laterals as they come.

The plants should be well watered, and occasionally a handful of bonedust and blood manure mixed should be forked in around the roots. Where stable manure is used, it should be used as a mulch, forking it in every three or four weeks, and making a fresh mulch.

All plants of the cucumber and melon family should now be constantly supplied with ample water. Pinch out unnecessary lateral growths, and also the terminals.

The following seeds may now be sown:—French beans, cabbage and cauliflower for winter crops, parsnip, lettuce, and celery.

The side shoots of celery plants should be removed, afterwards earthing up the plants. Asparagus beds should be top-dressed, and allowed to grow without any more cutting. The vegetable beds will need frequent forking and hoeing to keep the soil sweet, and to keep down all weeds.

The Flower Garden.

Plant out dahlias this month; tubers early, and plants grown from cuttings for exhibition blooms later in the month. Water well at planting, and keep well cultivated afterwards.

Rose bushes and beds may be given a good mulch with light stable manure, straw, grass, or lawn clippings. The beds should be kept rather dry, so as to allow the plants to rest before the autumn period of growth.

Sow seeds of cosmos, asters, zinnia, balsams, cockscomb, and other late summer and autumn blooming annuals.

Cut down delphiniums that have yielded their first crop of flowers, so as to allow a succession of flowers to come.

Daffodil, hyacinth, tulip, ranunculus, anemone, and other bulbs and tubers may be taken up and stored: while gladioli corms may still be planted.

The garden must be kept well watered and cultivated, so as to tide the plants over the hot and dry season.

Bacterial Disease of Rose.

In these notes for November, 1915, attention was drawn to the considerable increase of a new disease in roses, which was determined by Mr. Brittlebank to be of bacterial origin. The young shoots and leaves began to shrivel, turning black and finally dying, and then the main shoot would die, and lastly the whole plant. As a result of investigation during the past season, it has been found that the painting with a strong brush of the plants affected with a solution of permanganate of potash is exceedingly beneficial to the plants, several rose bushes having made good recovery as a result of the applications.

The potash should be used at the rate of half-an-ounce to the gallon of water. In brushing the stems care should be taken that the solution does not drop to any extent on the foliage. Three or four applications will be necessary, with an interval of about a fortnight between each one.

REMINDERS FOR JANUARY.

LIVE STOCK.

Horses.—*Stabled.*—Over-stimulating and fattening foods should be restricted. Water should be allowed at frequent intervals. Rub down on coming into stables in an overheated condition. Supply a ration of greenstuff, where possible, to all horses. *Brood mares* should be well fed on succulent food if available; otherwise, oats and bran should be given. *Foals* may with advantage be given oats to the extent of 1 lb. for each month of age daily. Provision should be made for shade shelter for paddocked horses.

Cattle.—Provide succulent fodder and plenty of clean water and shade. Provide "lick" in trough, consisting of salt 20 lbs., bone meal 20 lbs., and sulphate of iron ½ lb. Limewash the cow bails, it helps to keep down flies. Provide calves, if possible, with good grass run, or lucerne hay or oats in a trough.

Pigs.—Supply short bedding in warm, well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate

trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal per 100 lbs. live weight in food daily. If pigs are lousy, dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now. Plenty of water should be available for them to wallow in in hot weather.

Sheep.—Ewes, after a season such as this, will come in season well to time. Merino and fine comebacks, November and December; crossbreds, January and February; pure British breeds, February and March. Be sure of ample rams running with them. Breed from every good ewe possible. Keep in view wool production as well as lamb and mutton. Meat and wool will be amongst the foremost commodities in demand for several years. Two-tooth ewes, if well grown, can be bred from, but they should be well treated throughout. Use rams with width and substance, and never inferior-fleeced ones. Rams work best at night and early morning. With large paddocks it may be necessary to yard occasionally in a season like this. Purgative drenches, worm pills, &c., should be given to all lambs, weaners, or grown sheep showing unhealthy discharge, for this is the chief attraction to the fly.

Poultry.—Separate the sexes; the cockerels should now be fattened and marketed. Grade the young stock according to age and size, otherwise the younger birds will not thrive. Avoid overcrowding. Do not force pullets too much with animal food; build them up with a good variety of food, but avoid maize, and give but little meat. Increase the green food; thoroughly spray houses and perches with an emulsion of kerosene and soapsuds, or a solution of carbolic acid 1 in 60. Keep water vessels in shady spot, and renew water twice daily. Moisten dust bath.

CULTIVATION.

Farm.—Get all crops harvested and stacked as soon as possible. Horse-hoe maize, potatoes and other summer crops. See to insurance of stacks of grain and hay.

Orchard.—Keep the soil well scarified and weed free. Cultivate after irrigation or rain. Do not allow the surface to become caked. Spray against codlin moth, pear slug, vine caterpillar, and woolly aphis. Summer prune strong growing shoots and laterals.

Vegetable Garden.—Plant out all seedlings, when ready, from former sowings. Stir and mulch the surface. Dig each plot as it becomes vacant. Sow seeds of cauliflower, cabbage, peas, French beans, Kohl Rabbi, &c.

Flower Garden.—Keep the soil moist and cool by watering, hoeing, and mulching. Stake tender and lengthy plants. Water and shade young plants. Sow pansy, Iceland poppy, cosmos, aster, &c.

Vineyard.—Summer butt or *Yema* grafting may be practised in January, though February is the usual month. This is the slackest month in un-irrigated vineyards—all ordinary work should be completed before Christmas. It is only exceptional operations, such as scarifying after rain or sulphuring in case of odium, that must be carried out. In irrigated vineyards the application of water, and the cultivation it necessitates, require attention.

Cellar.—Fill up regularly and keep cellar as cool as possible. Towards end of month commence to make preparations for the coming vintage.

INDEX OF VOLUME XIV.

The Index of Vol. XIV. will be supplied with the first number of Vol. XV., viz., 10th January, 1917.

THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE, VICTORIA.

VOLUME XIV. Parts 1–12.

INDEX.

Page

Abortion, Contagious 321
Agriculture—
Agriculture and Science—A Remarkable Discovery—Peat Bacterized 249
Cost of Production of Field Crops—Wheat 296
Golden Wheat—Victoria's Record Harvest 116
Green Manure Tests ... 290
Light and Heavy Dressings of Superphosphate, Werribee ... 288
Lucerne Manurial Tests ... 449
Manure Tests, Longerenong ... 149
Nhill Agricultural Society's Annual Crop and Fallow Competition, 1915 79
Nitrogenous Nodules ... 161
Nodules, Nitrogenous ... 161
Permanent Fertilizer Tests, Werribee 148
Permanent Rotation Tests, Werribee 147
Pickling Wheat 275
Rate of Sowing and Time of Seeding Trials, Werribee ... 294
Reclamation of Plain Land in South Gippsland 232
Researches in Wheat Selection 140
Results of Experiments, 1915, Werribee 147, 288
Rice Cultivation 493
Rotation Tests, Permanent, Werribee 147
Rutherglen Experimental Farm —Farmers' Field Day ... 18
Seed Wheat Varieties for Distribution among Farmers ... 65
Share Farming Results ... 179
Sowing and Seeding Tests 151, 294
Sulphate on Crops, Effect of 639
Time of Sowing and Rate of Seeding Tests, Wyuna ... 151
Variations in the Plants from the Same Head of Wheat ... 168
Variety Wheat Tests, Mallee 151
Wyuna State Farm, Farmers' Field Day 100
Agriculture and Science—
A Remarkable Discovery—Peat Bacterized 249

Page

Ailments—
Contagious Abortion ... 32
Alcohol Tables, The New ... 48
Ammonia Accidents and Emergency Relief 21
Ammonia Sulphate as a Fertilizer 59
Ammonia, The World's ... 71
Analyses and Approximate Value, Farmyard Manures 23
Apiculture—
Honey Flora of Victoria, The 170, 244, 479, 68
Nosema Apis in Victoria ... 62
Apple Culture in Victoria ... 471, 522, 577, 655, 71
Apple Drying 12
Archer, R. T.—
Butter Fat in Cheese ... 1
Champion Butter Fat Test at the Royal Agricultural Show 7
Lucerne, What shall we do with Our 3
Archer, R. T., and Robertson, W. A. N., B.V.Sc.—
Dairy Produce, Comparative Food Values of 6
Herd Testing—Fourth Annual Report of the Pedigree Herds, Year ended 1916 ... 5
Artificial Fertilizers 6
Artificial Fertilizers Act—
Inspection under the Artificial Fertilizers Act ... ...
Artificial Manures Acts—
Unit Values for 1916 ...
Ash, E. E.—
Butter, Farm Manufactured ... 6
Bacon Curing 6
Baking and Milling Tests of Victorian Wheat 6
Barr, B. A.—
Feeding Terms ... ...
Food Values and Rations ...
Hand-feeding Dairy Cows ...
Herd Improvements—Breeding for Butter Fat ... ...
Lesson on the Drought, A. ...
The Dairy Cow as a Machine

16350.—2

Page

Bee-keeping—
Bee-keeping in Victoria ... 170, 244, 479, 687
Nosema Apis in Victoria ... 629
Beuhne, F. R.—
Bee-keeping in Victoria ... 170, 244, 479, 687
Eucalyptus Oil 742
Nosema Apis in Victoria ... 629
Black, A. J.—
Lambs for Export, Note on . 238
Blue Mould in Tobacco Plants 601
Botany—
Vernacular Names of Victorian Plants ... 55, 180, 240, 499
Building up a Flock 442
Burney, M. d'A.—
Portuguese Varieties of Vines 398
Butter, Farm manufactured ... 633
Butter Fat, Breeding for—Herd Improvement 89
Carmody, P. J.—
Fruit Prospects, 1916-17 ... 705
Castella, F. de—
Grapes at the Panama-Pacific Exposition, Victorian Fresh 31
Vine Varieties, Notes on Portuguese 400, 565, 622, 673, 731
Certification of Stallions, Government 280
Champion Butter Fat Test at the Royal Agricultural Show ... 752
Cheese, Butter Fat in ... 120
Churches, H. C.—
Poisoning Crows 279
Citrus Nursery, Wahgunyah ... 349
Cole, C. F.—
Walnut, The 154
Competition, Tree Planting ... 413
Conditions Governing the Distribution of Phylloxera-resistant Vine Rootlings and Cuttings ... 88
Cost of Production of Field Crops, Wheat ... 296
Cows, Growing Feed for—Lessons of the Drought . 505
Cows—Standard Test—Quarterly Reports 117, 376, 533, 754
Crows, Poisoning 279
Curlewis, A. W.—
Sheep Dip, A 694
Sheep Dips 423
Dairy Cows as a Machine ... 34
Dairy Heifers, The Raising of ... 385
Dairying—
Abortion, Contagious ... 321
An Experiment to Show Effect on Quantity and Quality of Milk Produced by Cows when Milked at Equal and Unequal Periods 744
Butter, Farm manufactured ... 633
Butter Fat in Cheese ... 120
Champion Butter-fat Test at the Royal Agricultural Show 752
Cows, Growing Feed for—Lessons of the Drought ... 505

Dairying—*continued*.
Cows—Standard Test—Quarterly Reports 117, 376, 533, 754
Dairy Produce, Comparative Food Values of 668
Ensilage, its Value and Cost of Production 97
Feeding Terms *409*
Feed, Stock and Produce, Comparative price of 311
Food Values and Rations . . 513
Guards for Watering Stock, Protecting 250
Hand-feeding Dairy Cows ... 193
Heifers, Breaking in ... 754
Heifers, The Raising of Dairy 385
Herd Improvements—Breeding for Butter Fat 89
Herd Testing—Fourth Annual Report of the Testing of Pedigree Herds, Year ended 1916 533
Herd, The Building of a Good 741
"Johnson Grass," Note on the Poisoning Effect of ... 653
Lesson on the Drought, A ... 153
Lucerne Manurial Tests ... 449
Lucerne, What shall we do with Our 309
Milk Yield, Increasing the ... 492
Mortality of Dairy Cows in the Hamilton District ... 728
Protecting Guards for Watering Stock 250
Saving Female Stock ... 759
Select your Bull 741
Silage, Digestibility of .. 412
Skim Milk, The Practical Economy of 162
Standard Test Cows—Quarterly Reports 117, 376, 533, 754
Surplus Lucerne Hay ... 138
Test your Cows *741*
The Dairy Cow as a Machine 34
Water for Stock, Purifying ... 177
Watering Stock, Protecting Guards for 250
Dairy Produce, Comparative Food Values of 668
Dip, Sheep 694
Dipping Sheep, The Profit that Arises from 94
Dips, Sheep 423
Drought, A Lesson on the ... 153
Drought, Lessons of—Cows, Growing Feed for 505
Efficiency, What is 93
Egg-laying Competition at Burnley, 1915-16, Fifth Victorian 59, 125, 188, 251, 312, 329
Egg-laying Competition at Burnley, 1916-17, Sixth Victorian 379, 443, 502, 571, 635, 699, 763
Egg-laying Competition at Burnley, 1915-16, Report on the Fifth Victorian *323*

	Page
Ensilage, its Value and Cost of Production	97
Eucalyptus Oil	742
Ewart, A. J., D.Sc., Ph.D.—	
Variations in the Plants from the Same Head of Wheat ...	168
Ewart, A. J., D.Sc., Ph.D., and Sutton, C. S., M.B., Ch.B.—	
Vernacular Names of Victorian Plants 55, 180, 240,	499
Experiment to Show Effect on Quantity and Quality of Milk Produced by Cows when Milked at Equal and Unequal Periods, An	744
Experiments, 1915, Results of 147,	288
Farm Life, The Social Side of	236
Farmers' Classes, Lectures and Stallion Parades	340
Farmers' Field Day, Rutherglen Experimental Farm	18
Farmyard Manures, Analyses and Approximate Value of ...	235
Farrell, J.—	
Apple Culture in Victoria 471, 522, 577, 655,	711
Apple Drying	196
Feeding Terms	409
Feed Stock and Produce, Comparative Price of	311
Fertilizer Act, Artificial—	
Inspection under the Artificial Fertilizers Act	15
Unit Values for 1916 ...	1
Fertilizer, Radium as a ...	412
Fertilizer, Sulphate of Ammonia as a	595
Fertilizer Tests, Werribee ...	148
Fertilizers, Artificial	632
Flock, Building up a	442
Flower, Fruit, and Vegetable Garden—Insect Pests 213, 314, 433, 495, 573,	604
Fodder—	
Ensilage, its Value and Cost of Production	97
Feeding Terms	409
Food Values and Rations ...	513
Growing Feed for Cows—Lessons of the Drought ...	505
Hand-feeding Dairy Cows ...	193
"Johnson Grass," Note on the Poisoning Effects of the ...	653
Lesson on the Drought, A ...	153
Stock Feed and Produce, Comparative Price of	311
Surplus Lucerne Hay ...	138
Yeast as a Food for Stock, Dried	187
Food Values and Rations ...	513
Food Values of Dairy Produce, Comparative	668
Foxes Killing Young Lambs ...	63
Franklin's Words of Wisdom ...	255
French, C., jun.—	
Insect Pests of the Fruit, Flower, and Vegetable Garden 213, 314, 433, 495, 573,	604
Fruit and Americans	152
Fruit, Flower, and Vegetable Garden, Insect Pests 213, 314, 433, 495, 573,	604
Fruit Nomenclature	612
Fruit Prospects, 1916-17 ...	705
Fuel, A Motor, "Natalite," consisting of Alcohol and Ether made from Molasses ...	698
Garden and Orchard Notes 61, 126, 190, 253, 317, 381, 445, 509, 573, 637, 701,	765
Golden Wheat—Victoria's Record Harvest	116
Gordon, G. S.—	
Meteorological Observations ...	178
Grant, Jas.—	
Growing Feed for Cows—Lessons of the Drought ...	505
Grapes at the Panama-Pacific Exposition, Victorian Fresh ...	31
Green Manure Tests	290
Green, W. Heber, B.Sc., and Richardson, A. E. V., M.A., B.Sc.—	
Researches in Wheat Selection	140
Guards for Watering Stock, Protecting	250
Hand-feeding Dairy Cows ...	193
Harness, Care of	243
Hart, A.—	
Egg-laying Competition at Burnley, 1915-16, Fifth Victorian 59, 125, 188, 251, 312,	329
Egg-laying Competition at *Burnley, 1916-17, Sixth Victorian* 379, 443, 502, 571, 635, 699,	763
Egg-laying Competition at Burnley, 1915-16—Report on Fifth Victorian	329
Poultry-keeping, Practical ...	366
Heifers, Breaking in	754
Heifers, The Raising of Dairy ...	385
Herd Improvements—Breeding for Butter Fat	89
Herd Testing—Fourth Annual Report of the Testing of Pedigree Herds, Year ended 1916	533
Herd, The Building of a Good ...	741
Honey Flora of Victoria, The 170, 244, 479,	687
Hops, New Variety of	106
Horses—	
Care of Harness	243
Government Certification of Stallions	280
Lucerne for	570
Ninth Annual Report (Season 1915) on the Veterinary Examination of Stallions ...	354
Protecting Guards for Watering	250
Sore Shoulders in	235
Stallion Parades, Lectures, and Farmers' Classes	340
Stallions, List of Life Certificated	283

Page

Horses—*continued.*
Stallions, *List of Terminable Certificated* 285
Stallions—Regulations ... 360
Horticulture—
Apple Culture in Victoria 471, 522, 577, 655, 711
Apple Drying 196
Citrus Nursery, Wahgunyah ... 349
Fruit and Americans ... 152
Fruit Nomenclature 612
Fruit Prospects, 1916-17 ... 705
Insect Pests, Cost of ... 438
Insect Pests of the Fruit, *Flower, and Vegetable Garden* 213, 314, 433, 495, 573, 604
Lemons and Oranges, Composition of Frozen 353
Orchard and Garden Notes 61, 126, 190, 253, 317, 381, 445, 509, 573, 637, 701, 765
Report on Experiment in Picking, Packing, Handling, Cool Storage, and Transportation of Peaches 41
Stockholm Tar 442
Walnut, The 154
Houser, True., Humbert, J. G., Selby, A. D., Smith, T. A. J.—
Blue *Mould in Tobacco* ... 601
Treatment of Tobacco Plant Beds 601
Humbert, J. G., Houser, True., Selby, A. D., Smith, T. A. J.—
Blue Mould in Tobacco ... 601
Treatment of Tobacco Plant Beds 601
Hunt, H. A.—
Rainfall, Victorian 121, 439, 507, 760
Insect Pests, Cost of 438
Insect Pests of the Fruit, Flower, and Vegetable Garden 213, 314, 433, 495, 573, 604
Inspection under the Artificial Fertilizers Act 15
"Johnson Grass," Note on the Poisoning Effect of the ... 653
Kerr, J. M.—
Skim Milk, The Practical Economy of 162
Kerr, R. R.—
Ensilage, its Value and Cost of Production 97
Heifers, the Raising of Dairy ... 385
Kyle, J.—
Test your Cows 741
Lamb-breeding Tests 129
Lambs for Export, Note on ... 238
Lectures, Farmers' Classes, and Stallion Parades 340
Lemons and Oranges, Composition of Frozen 353
Light and Heavy Dressings of Superphosphate, Werribee ... 288
Light, Wall Papers that Destroy 441

Page

Litters in Saving Natural *Manures, The Use of* ... 628
Longerenong Agricultural College—
Manure Tests 149
Lucerne *for Horses* 570
Lucerne, Manurial Tests ... 449
Lucerne, what shall we do with Our 309
Mallee—
Variety Wheat Tests ... 151
Manure Tests, Green 290
Manure Tests, Permanent, Longerenong 149
Manures—
Ammonia, The World's ... 710
Artificial Fertilizers ... 632
Artificial Fertilizers Act, Inspection under the ... 15
Artificial Fertilizers Act, Unit Values for 1916 1
Farmyard Manures, Analyses and Approximate Value ... 235
Fertilizers Tests, Permanent, Werribee 148
Green Manure Tests ... 290
Light and Heavy Dressings of Superphosphate 288
Lucerne Manurial Tests ... 449
Permanent Manure Tests, Longerenong 149
Phosphatic Ore, A New ... 218
Potash from Seaweed ... 169
Radium as a Fertilizer ... 412
Sulphate of Ammonia as a Fertilizer 595
Sulphate on Crops, Effect of ... 639
The Use of Litters in Saving Natural 628
Marshall, J. C.—
Meat Preservation on the Farm 596
Meat Preservation *on the Farm* 596
Medicinal Vegetable, Spinach as a 274
Meeking, E.—
Report on Experiment in Picking, Packing, Handling, Cool Storage, and Transportation of Peaches 41
Mess, A.—
Select your Bull 741
Meteorological Observations ... 178
Milk Produced by Cows when Milked at Equal and Unequal Periods—An Experiment to Show Effect on Quantity and *Quality of* 744
Milk, Skim, The Practical Economy of 162
Milk Yield, Increasing the ... 492
Milling and Baking Tests of Victorian Wheat 641
Molasses for Solving the Potash Problem 119
Mortality of Dairy Cows in the Hamilton District 728
Mullett, H. A., B.Ag.Sc.—
Pickling Wheat 275

Page

Murphy, E. W.—
Mortality of Dairy Cows in the Hamilton District ... 728
"Natalite"—A Motor Fuel consisting of Alcohol and Ether made from Molasses ... 698
Nhill Agricultural Society Annual Crop and Fallow Competition, 1915 79
Nitrogenous Nodules 161
Nodules, Nitrogenous 161
Nomenclature of Fruit ... 612
Nosema Apis in Victoria .. 629
Observations, Meteorological ... 178
Oranges and Lemons, Composition of Frozen 353
Orchard and Garden Notes 61, 126, 190, 253, 317, 381, 445, 509, 573, 637, 701, 765
Outbuildings, Paint for ... 99
Paint for Outbuildings ... 99
Paint, Vegetable 499
Panama-Pacific Exposition, Victorian Fresh Grapes at ... 31
Peaches, Report on Experiment in Picking, Packing, Handling, Cool Storage, and Transportation of 41
Peat, Bacterized—Science and Agriculture — A Remarkable Discovery 249
Permanent Fertilizer Tests, Werribee 148
Permanent Manure Tests, Longerenong 149
Permanent Rotation Tests, Werribee 147
Pescott, E. E.—
Fruit Nomenclature 612
Orchard and Garden Notes 61, 126, 190, 253, 317, 381, 445, 509, 573, 637, 701, 765
Phosphatic Ore, A New .. 218
Planting and Reconstitution of Vineyards 88
Plants, Vernacular Names of Victorian 55, 180, 240, 499
Poisoning Crows 279
Poisoning Effects of "Johnson Grass," Notes on 653
Portuguese Varieties of Vines ... 398
Portuguese Vine Varieties, Notes on 400, 565, 623, 673, 731
Potash from Olive Oil Residues 621
Potash from Seaweed 169
Potash Problem, Molasses for Solving 119
Potatoes—
Cultivation 590
Cutting Seed and Rate of Seeding per Acre—Potato Cultivation 590
Experimental Fields, 1915-16 107
Experiments in the Cultivation of Potatoes, 1915-16 ... 461
Field Crop Competitions (Potatoes) 372

Page

Poultry—
Egg-laying Competition at Burnley, 1915-16, Fifth Victorian 59, 125, 180, 251, 312, 329
Egg-laying Competition at Burnley, 1916-17, Sixth Victorian 379, 443, 502, 571, 635, 699, 763
Egg-laying Competition at Burnley. Report on the Fifth Victorian 329
Poultry Keeping, Practical ... 366
Produce, stock and feed, Comparative price of 311
Protecting guards for watering stock 250
Radium as a fertilizer ... 412
Rainfall in Victoria 121, 439, 507, 760
Rainfall, Relationship between the average wheat yield and the Winter Rainfall ... 37
Ramsay, J. T.—
Cutting Seed and rate of seeding per acre. Potato Cultivation 590
Experiments in the Cultivation of Potatoes, 1915-16 ... 461
Field Crop Competition (Potatoes) 372
Potato Cultivation 590
Potato Experimental Fields, 1915-16 107
Rate of Sowing and Seeding trials 294
Reclamation of Plain Land in South Gippsland 232
Reminders for the Month 63, 128, 191, 255, 319, 384, 448, 511, 575, 639, 703, 767
Researches in Wheat Selection... 140
Results of Experiments, 1915, Werribee ... ... 147, 28[illegible]
Rice Cultivation, Koyuga ... 49[illegible]
Richardson, A. E. V., M.A., B.Sc.—
Experiments, 1915, Results of ... ... 147, 28[illegible]
Green manure tests ... 29[illegible]
Light and Heavy Dressings of Superphosphate ... 28[illegible]
Lucerne Manurial Tests ... 44[illegible]
Manure Tests, Permanent... 14[illegible]
Permanent Fertilizer Tests, Werribee ... ... 14[illegible]
Permanent Rotation Tests, Werribee ... .. 14[illegible]
Relationship between the average Wheat Yield and the Winter Rainfall ... 3[illegible]
Seeding and Sowing Tests, Wyuna ... ... 15[illegible]
Seed Wheat Varieties for distribution among Farmers ... ... 6[illegible]
Variety Wheat Tests, Mallee 15[illegible]
Wheat Crops for 1916, The 25[illegible]

Page

Richardson, A. E. V., M.A., B.Sc., and Green, W. Heber, D.Sc.—
Researches in Wheat Selection 140
Robertson, W. A. N., B.V.Sc.—
Abortion, Contagious . 321
Government Certification of Stallions 280
Ninth Annual Report (Season 1915) on the Veterinary Examination of Stallions ... 354
Stallions, List of Life Certificated 283
Stallions, List of Terminable Certificated 285
Stallions, Regulations ... 360
Robertson, W. A. N., B.V.Sc., and Archer, R. T.—
Herd-testing. Fourth Annual Report of the Testing of Pedigree Herds, year ended 1916 533
Robertson, W. C., and Scott, P. R.—
Inspection under the Artificial Fertilizers Act ... 15
Rotation Tests, Permanent, Werribee 147
Rutherglen Experimental Farm, Farmers' Field Day ... 18
Science and Agriculture. Peat Bacterized 249
Scott, P. R.—
Artificial Fertilizers Act, Unit Values for 1916 1
Scott, P. R., and Robertson, W. C.—
Inspection under the Artificial Fertilizers Act ... 15
Scott, P. R., and Winslow, F. G. B.—
Baking and Milling Tests of Victorian Wheat 641
Sea-weed, Potash from ... 169
Seed Wheat Varieties for Distribution among Farmers ... 65
Selby, A. D., Houser, True., Humbert, J. G., and Smith, T. A. J.—
Blue Mould in Tobacco Plants 601
Tobacco Plant Beds, Treatment of 601
Select your Bull 741
Share-farming Results ... 179
Sheep—
Building up a Flock 442
Dip, A 694
Dipping, The Profit that arises from 94
Dips 423
Lamb-breeding Tests ... 129
Lambs for Export, Note on ... 238
Saving Female Stock ... 759
Silage, Digestibility of ... 412

Page

Skim Milk, The Practical Economy of 162
Smith, T. A. J.—
Nhill Agricultural Society Annual Crop and Fallow Competition, 1915 ... 79
Reclamation of Plain Land in South Gippsland 232
Rice Cultivation, Koyuga ... 493
Surplus Lucerne Hay ... 188
Smith, T. A. J., Houser, True., Humbert, J. G., Selby, A. D.—
Blue Mould in Tobacco Plants 601
Tobacco Plant Beds, Treatment of 601
Social Side of Farm Life, The 236
Sore Shoulders in Horses ... 235
South Gippsland, Reclamation of Plain Land 232
Sowing and Seeding Tests, Wyuna 151, 294
Spinach as a Medicinal Vegetable 274
Stallion Parades 280
Stallion Parades and Farmers' Classes, Lectures 340
Stallions, Government Certification, Ninth Annual Report (Season 1915) 354
Stallions, List of Life Certificated 283
Stallions, List of Terminable Certificated 285
Stallions, Regulations ... 360
Standard Test Cows—Quarterly Reports 117, 376, 533, 754
Stock Feed and Produce, Comparative price of 311
Strahan, A.—
Farm Life, The Social Side of 236
Sulphate of Ammonia as a Fertilizer 59
Sulphate on Crops, Effect of ... 63
Superphosphate, Light and Heavy Dressings of ... 28
Surplus Lucerne Hay ... 18
Sutton, C. S., M.B., Ch.B., and Ewart, A. J., D.Sc., Ph.D.—
Vernacular Names of Victorian Plants 55, 180, 240, 49
Tar, Stockholm 44
Test Cows, Standard—Quarterly Reports ... 117, 376, 533, 75
Test your Cows 74
Tests, Permanent Fertilizer, Werribee 14
Tests, Permanent Rotation, Werribee 14
Time of Sowing and Rate of Seeding Tests, Wyuna ... 1
Tobacco Plant Beds, Treatment of 6
Tobacco plants, Blue Mould in 6
Tree Planting 2
Tree-planting Competition ... 4
Unit Values for 1916 ... ...

Page

Use of Litters in Saving Natural Manures, The 628
Variations in the Plants from the same Head of Wheat ... 168
Variety Wheat Tests, Mallee ... 151
Vegetable, Fruit, and Flower Garden, Insect Pests 213, 314, 433, 495, 573, 604
Vegetable Paint 499
Vegetable, Spinach as a Medicinal 274
Vernacular Names of Victorian Plants 55, 180, 240, 499
Victorian Fresh Grapes at the Panama-Pacific Exposition ... 31
Victorian Rainfall 121, 439, 507, 760
Viticulture—
Alcohol Tables, The New ... 487
Conditions Governing the Distribution of Phylloxera-resistant Vine Rootlings and Cuttings 88
Grapes at the Panama-Pacific Exposition, Victorian Fresh 31
Notes on Portuguese Vine Varieties 400, 565, 622, 673, 731
Portuguese Varieties of Vines 398
Vineyards, Planting and Reconstitution of 88
Viticultural Nursery, Wahgunyah 345
Wahgunyah Citrus Nursery ... 349
Wahgunyah Viticultural Nursery 345
Wall Papers that Destroy Light 441
Wallis, E.—
Tree Planting 219
Walnut, The 154
Water for Stock, Purifying ... 177
Watering Stock, Protecting Guards for 250
Werribee State Research Farm—
Fertilizer Tests, Permanent 148
Green Manure Tests ... 290
Light and Heavy Dressings of Superphosphate 288
Lucerne Manurial Tests ... 449
Meteorological Observations... 178

Page

Werribee State Research Farm—*continued.*
Rate of Sowing and Time of Seeding Trials 204
Results of Experiments, 1915 147, 288
Rotation Tests, Permanent 147
Wheat—
Cost of Production of Field Crops 296
Golden Wheat, Victoria's Record Harvest 116
Milling and Baking Tests of Victorian 641
Pickling 275
Relationship between the average Wheat Yield and the Winter Rainfall 37
Researches in Selection ... 140
Results of Experiments, 1915 147, 288
Seeding and Sowing Tests, Wyuna 151
Seed Varieties for Distribution among Farmers 65
Share-Farming Results ... 179
Sowing and Seeding Tests 151, 294
The Crop for 1916 257
Variations in the Plants from the same Head of 168
Variety Tests, Mallee ... 151
Whelan, A. J., and Wilson, H. C.—
Cost of Production of Field Crops, Wheat 296
Lamb-breeding Tests ... 129
Wilson, H. C., and Whelan, A. J.—
Cost of Production of Field Crops, Wheat 296
Lamb-breeding Tests ... 129
Winslow, F. G. B., and Scott, P. R.—
Baking and Milling Tests of Victorian Wheat ... 641
Wyuna State Farm—
Farmers' Field Day ... 100
Time of Sowing and Rate of Seeding Tests 151
Yeast, Dried, as Food for Stock 187

13 JUN 193